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(54) **AUTOINJECTOR**

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(57) **ABSTRACT**

An autoinjector includes a housing and a drive chassis arranged linearly moveable within the housing, the drive chassis including a dispensing limb and a trigger limb, wherein the trigger limb and the dispensing limb are arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal end of the dispensing limb and the trigger limb.

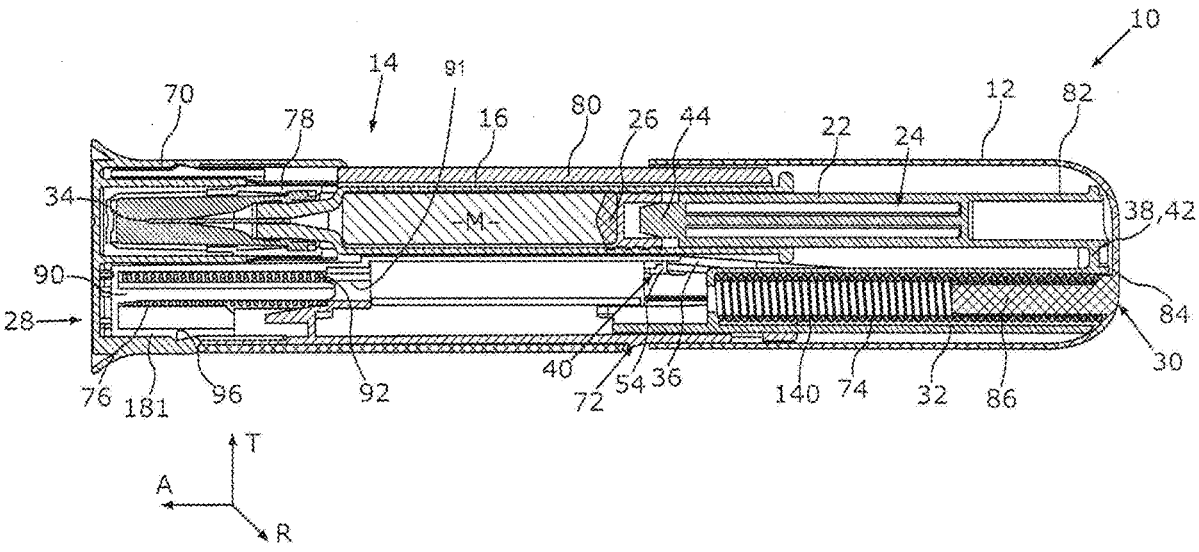


FIG. 1A

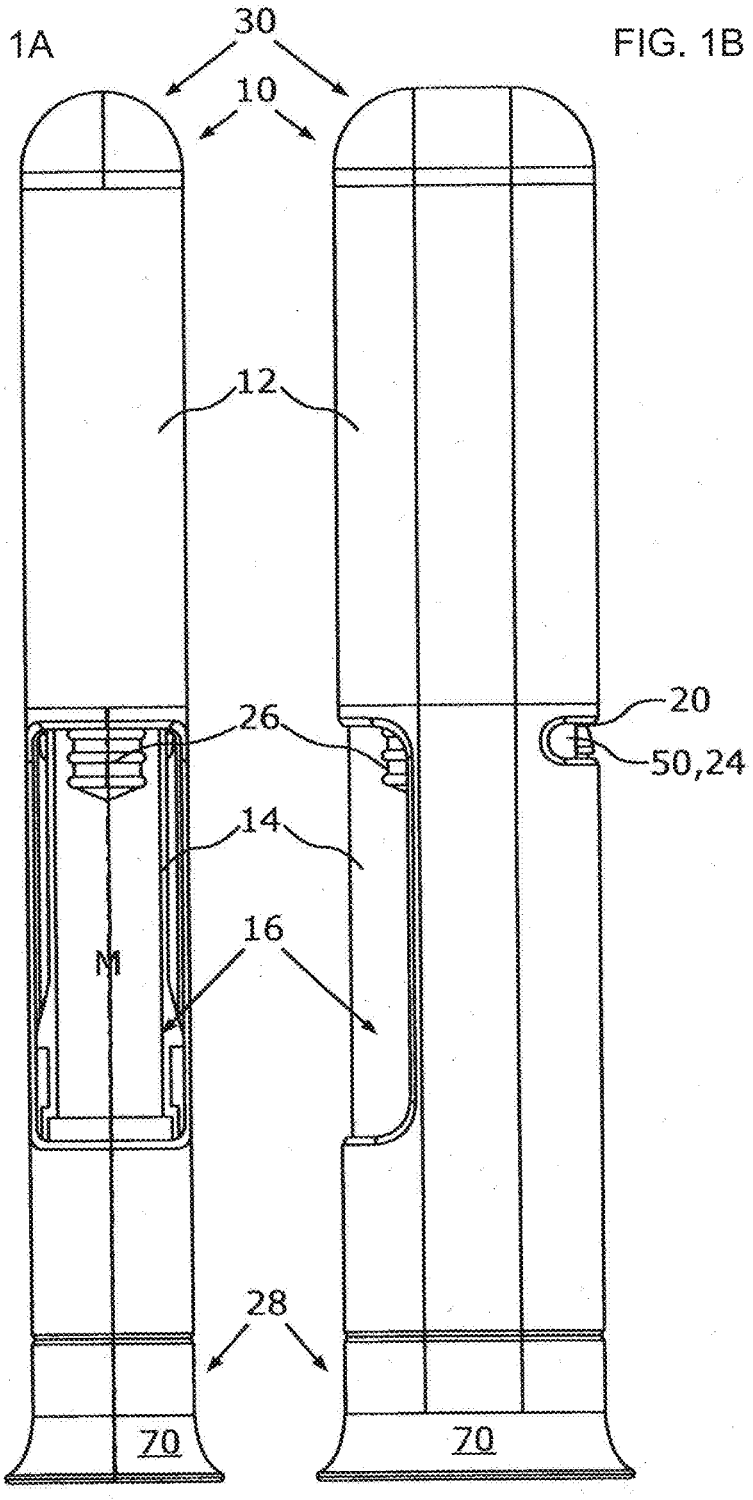


FIG. 1B

FIG. 2A

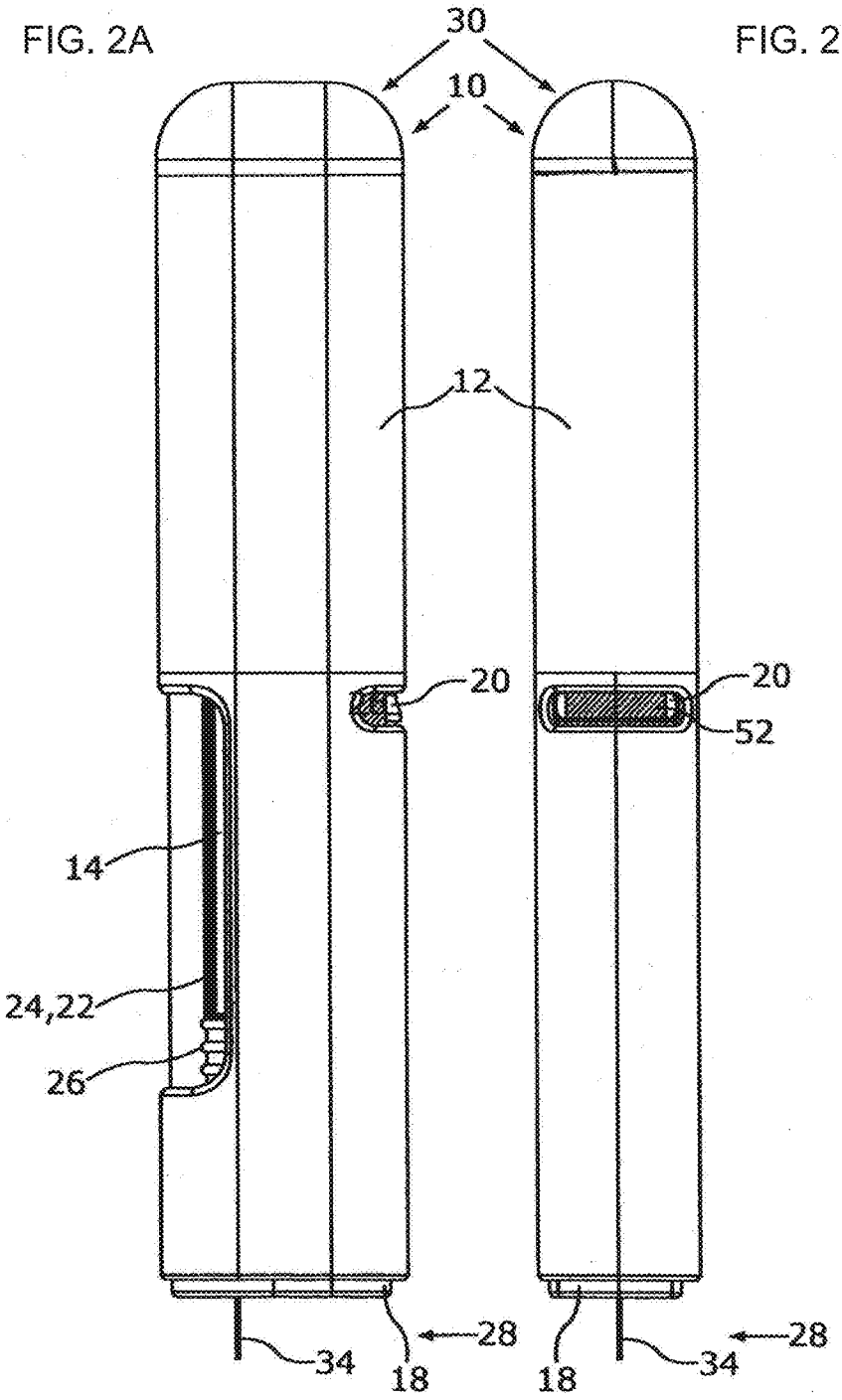


FIG. 2B

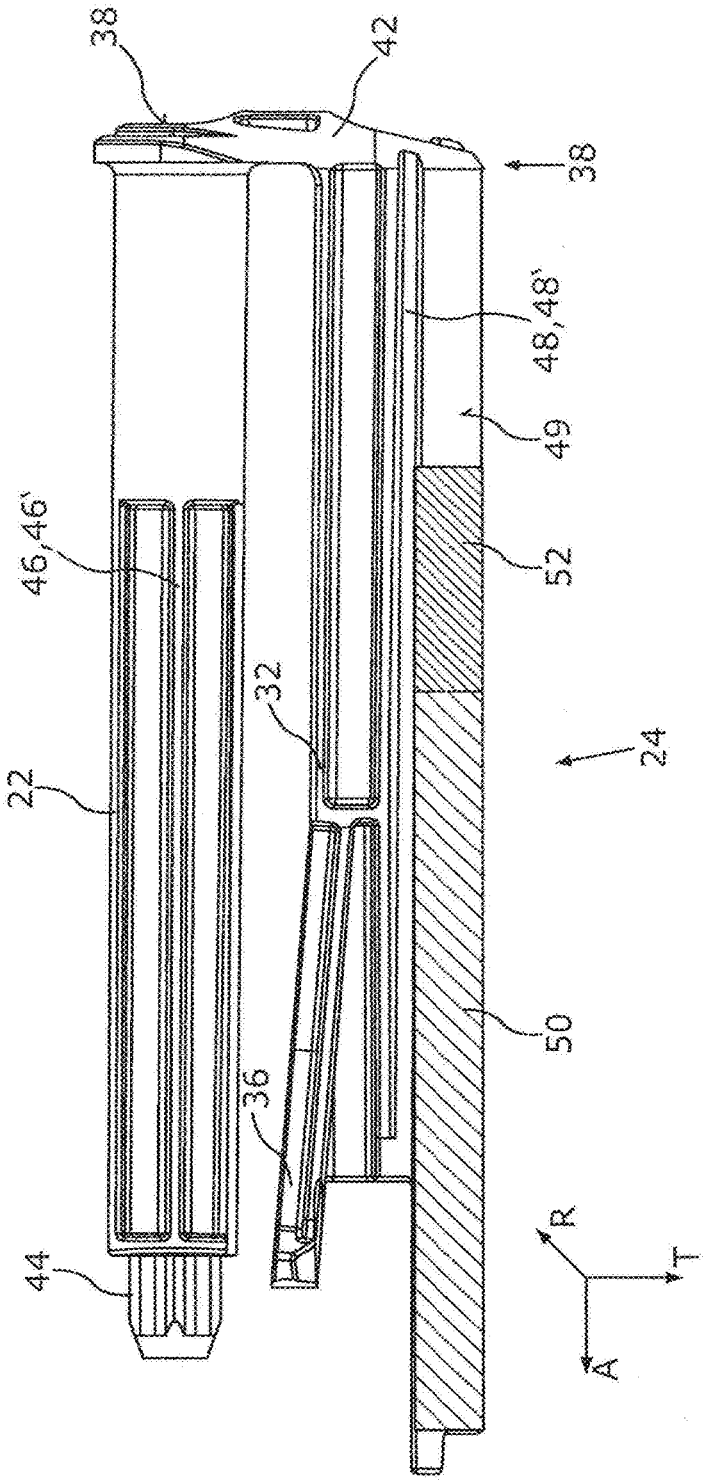


FIG. 3

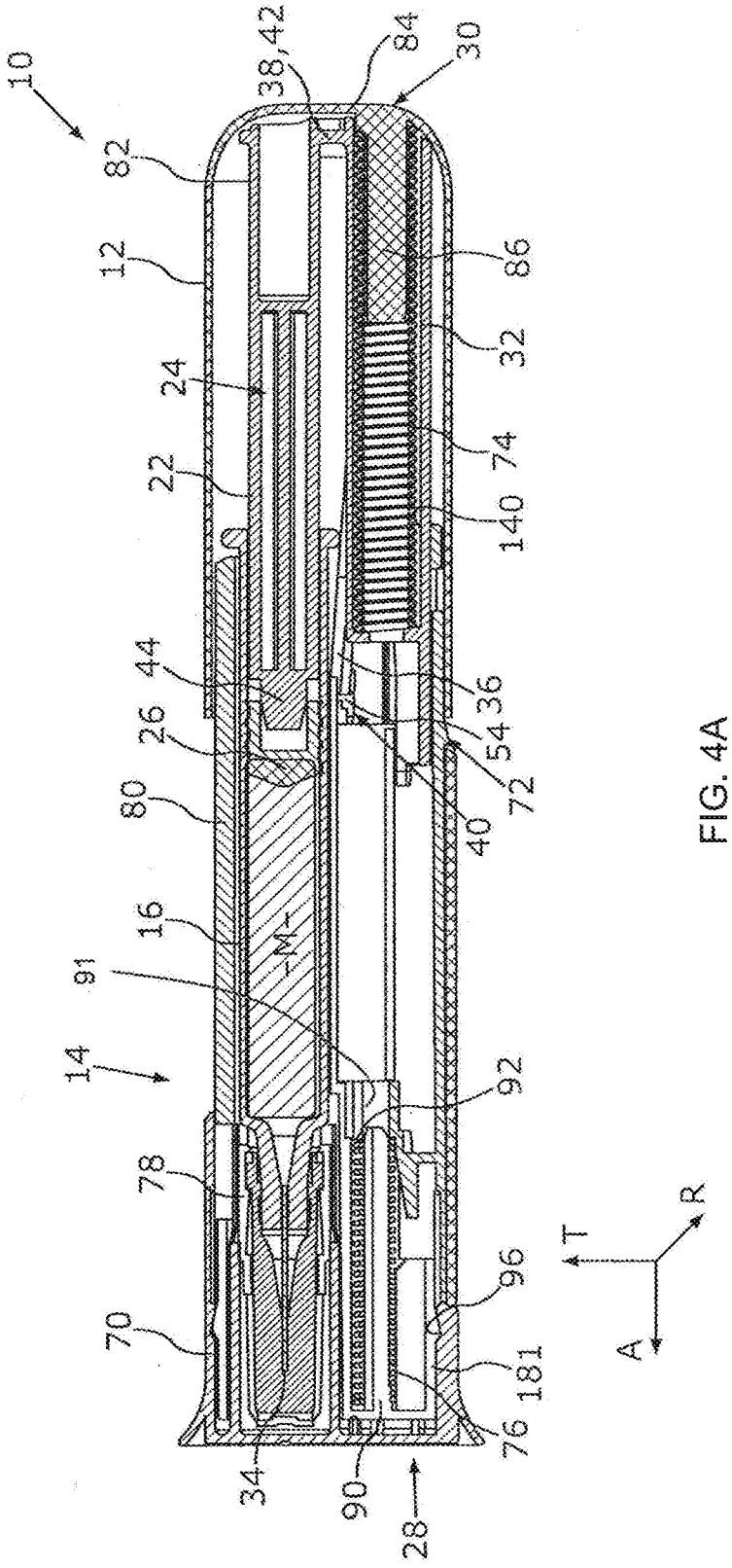

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FIG. 4A

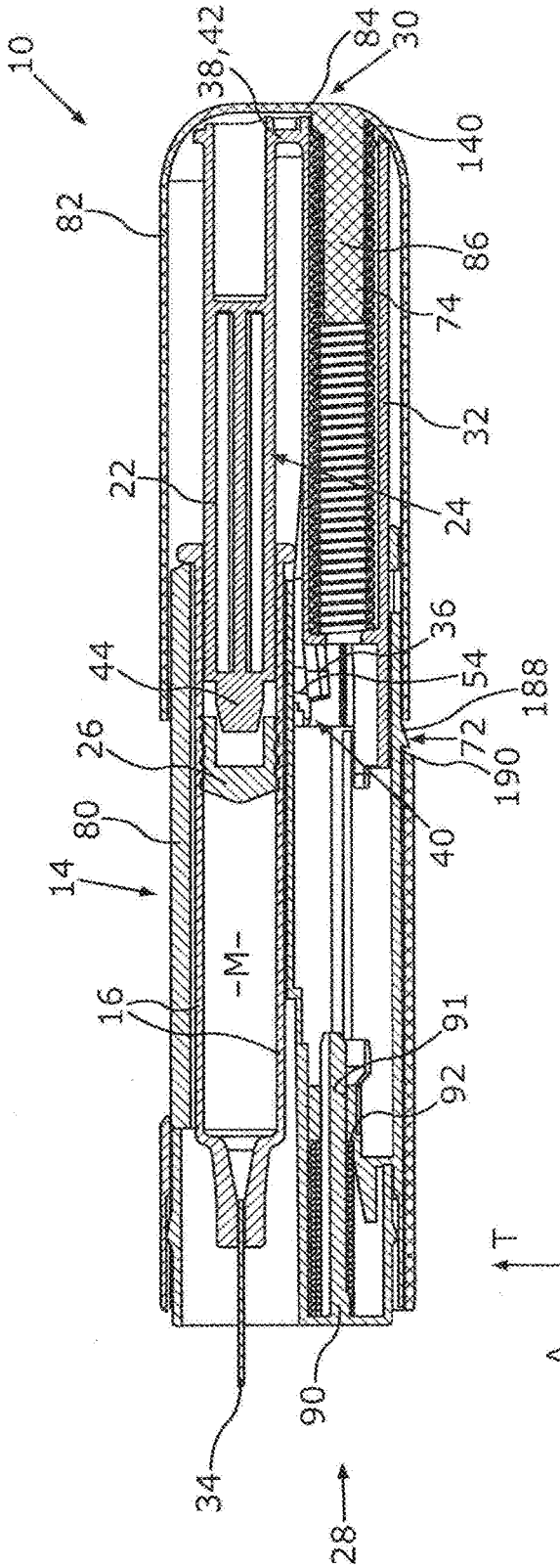

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FIG. 4B

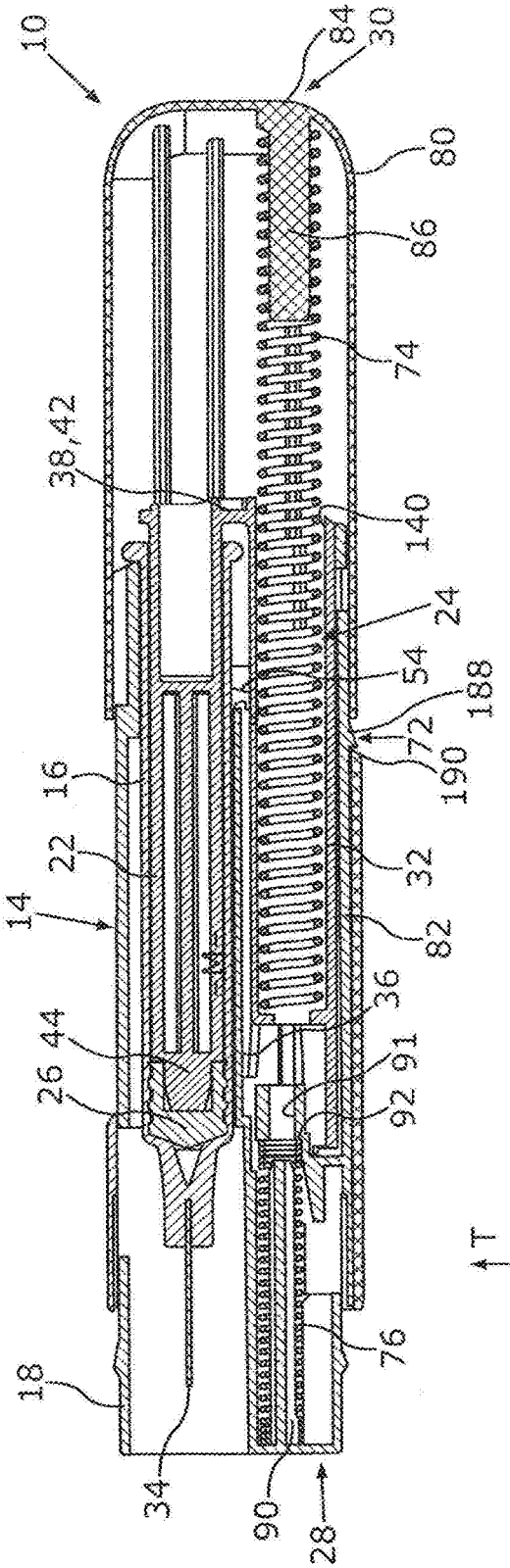

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FIG. 4C

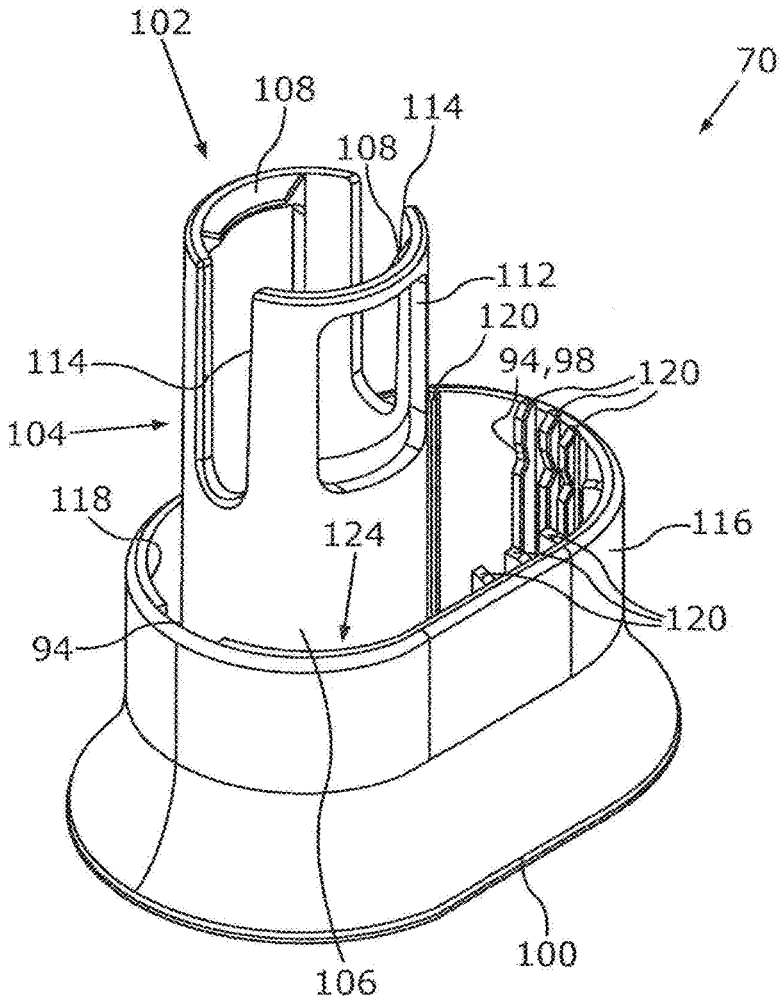

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FIG. 5A

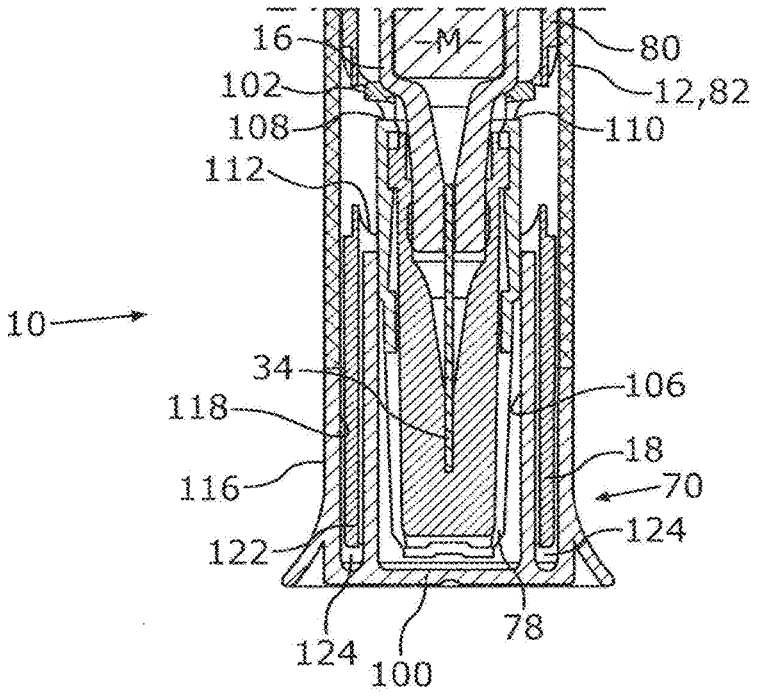

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FIG. 5B

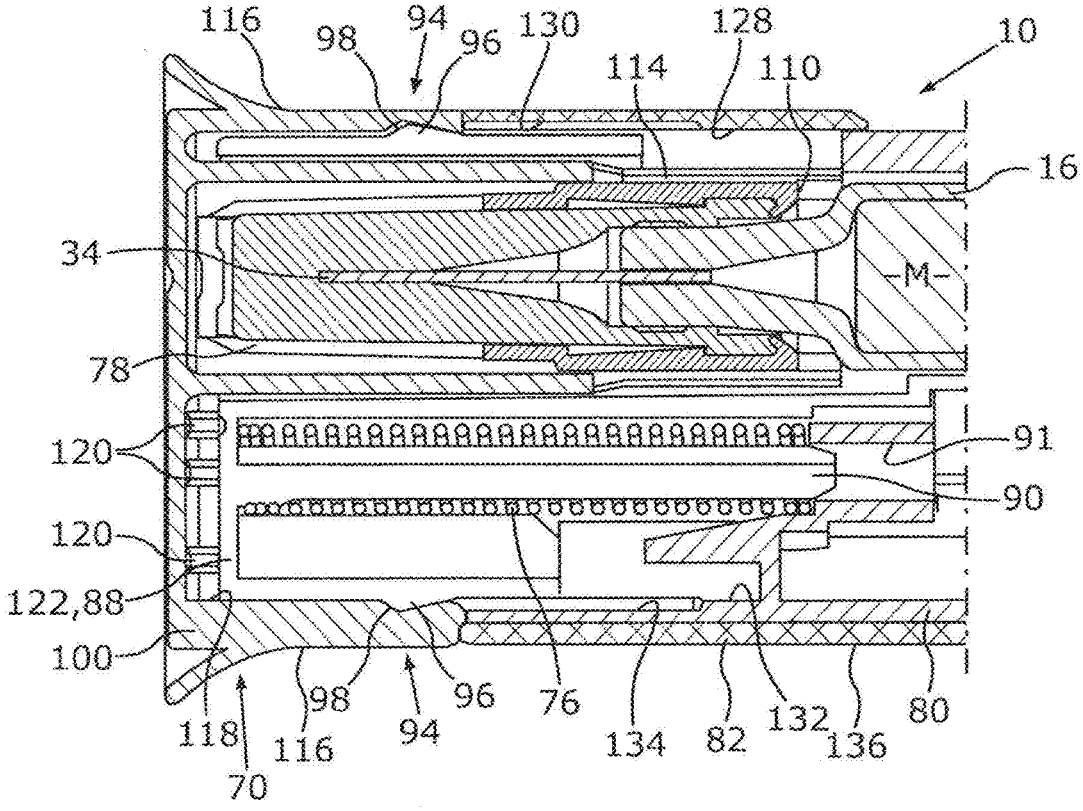

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FIG. 6

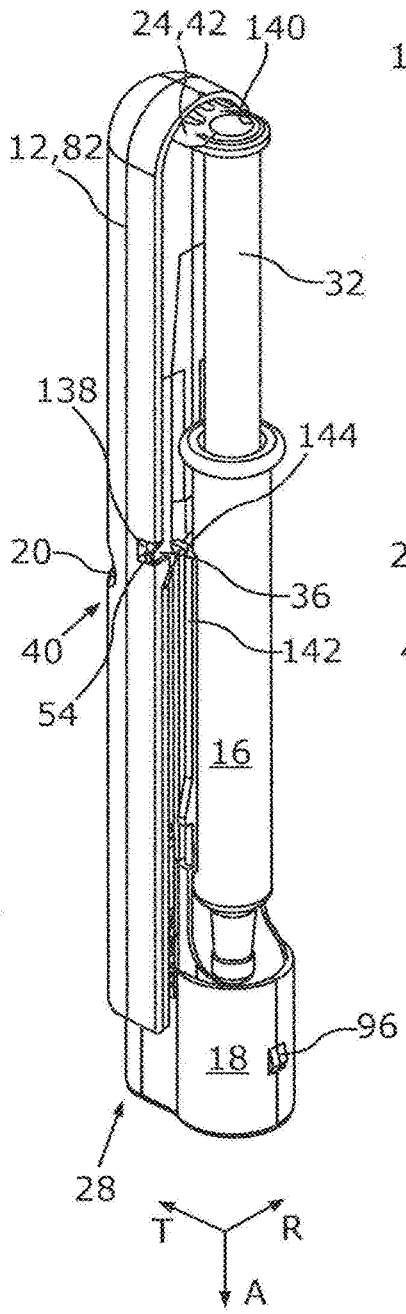


FIG. 7A

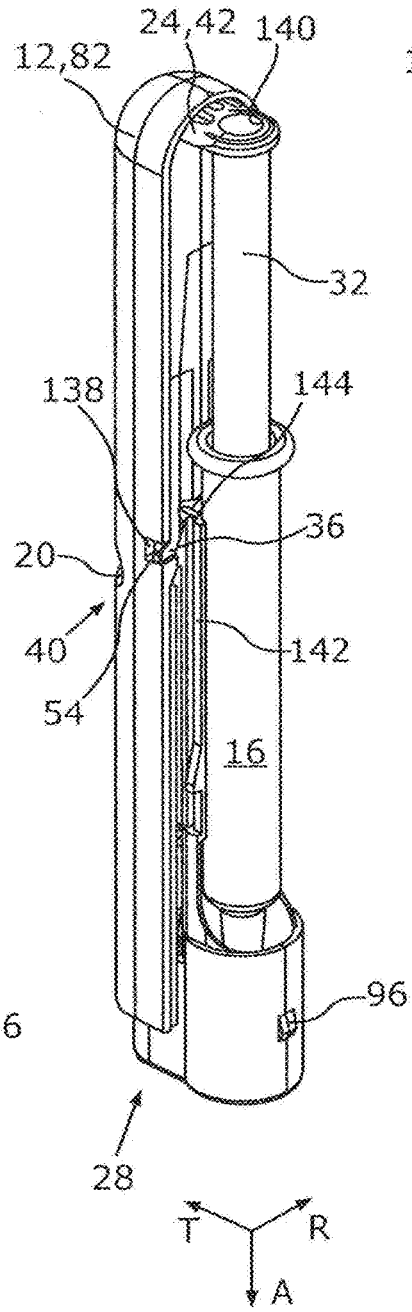


FIG. 7B

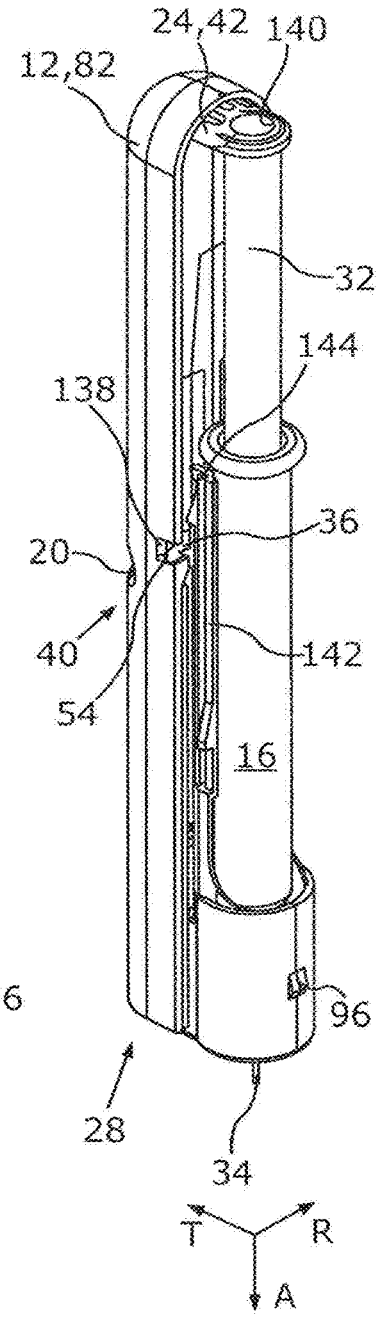


FIG. 7C

FIG. 8A

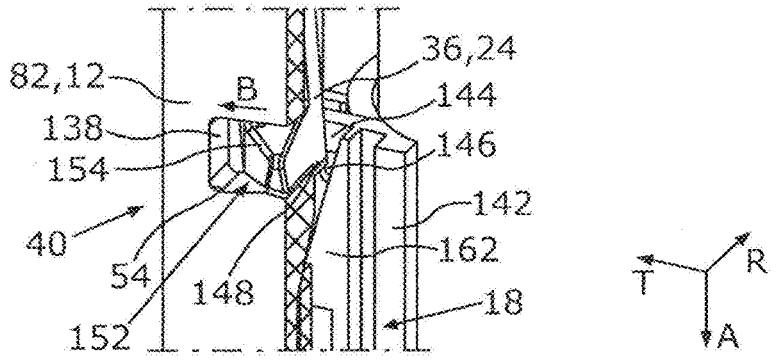


FIG. 8B

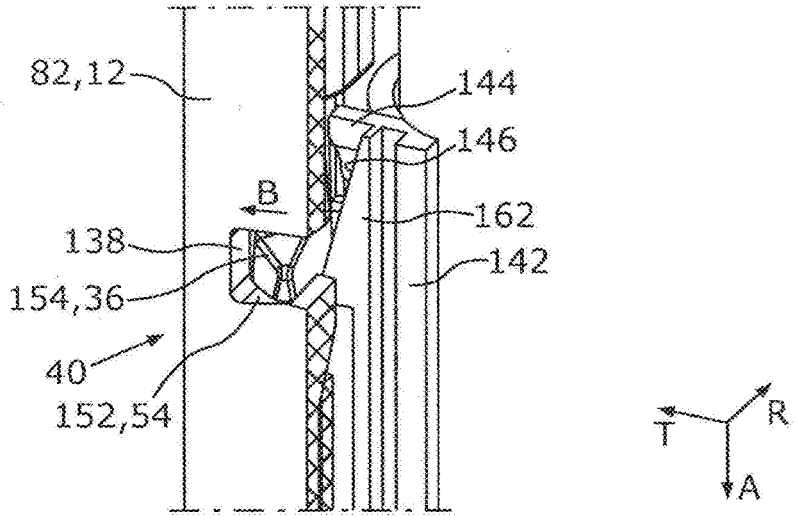


FIG. 8C

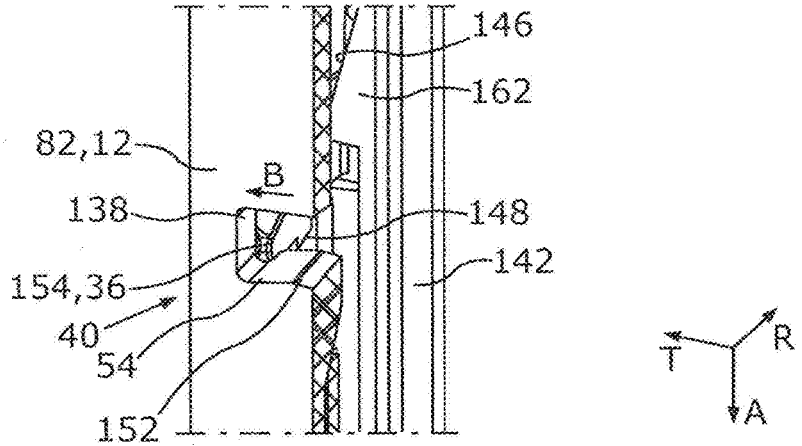


FIG. 9A

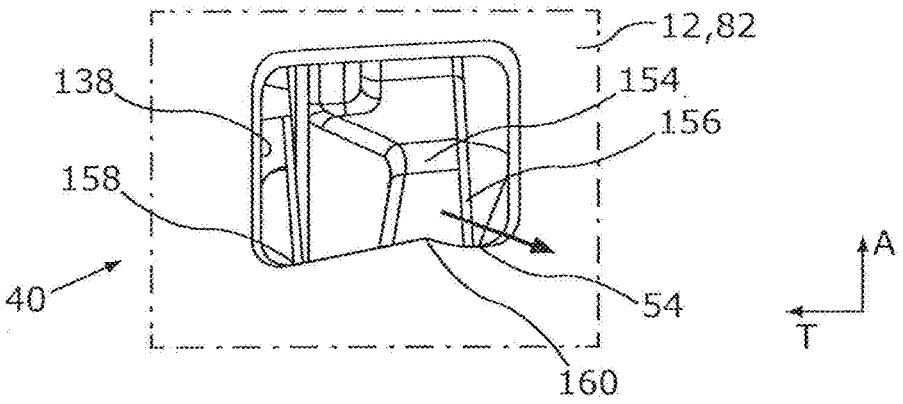


FIG. 9B

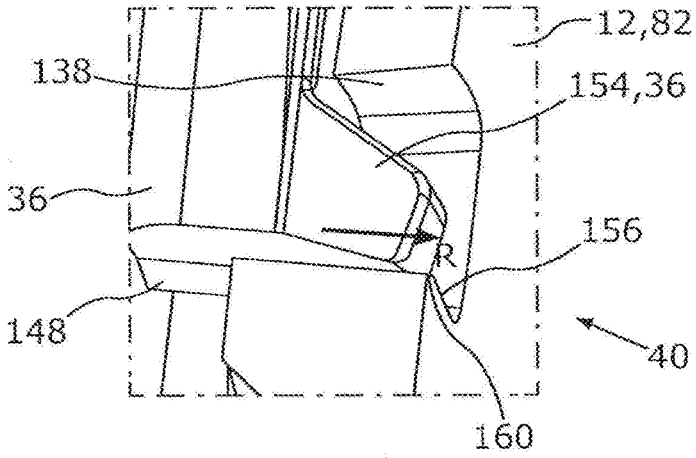


FIG. 9C

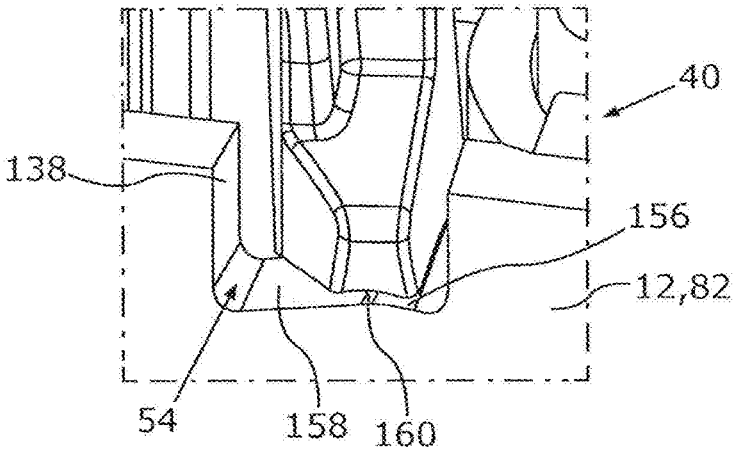


FIG. 10A

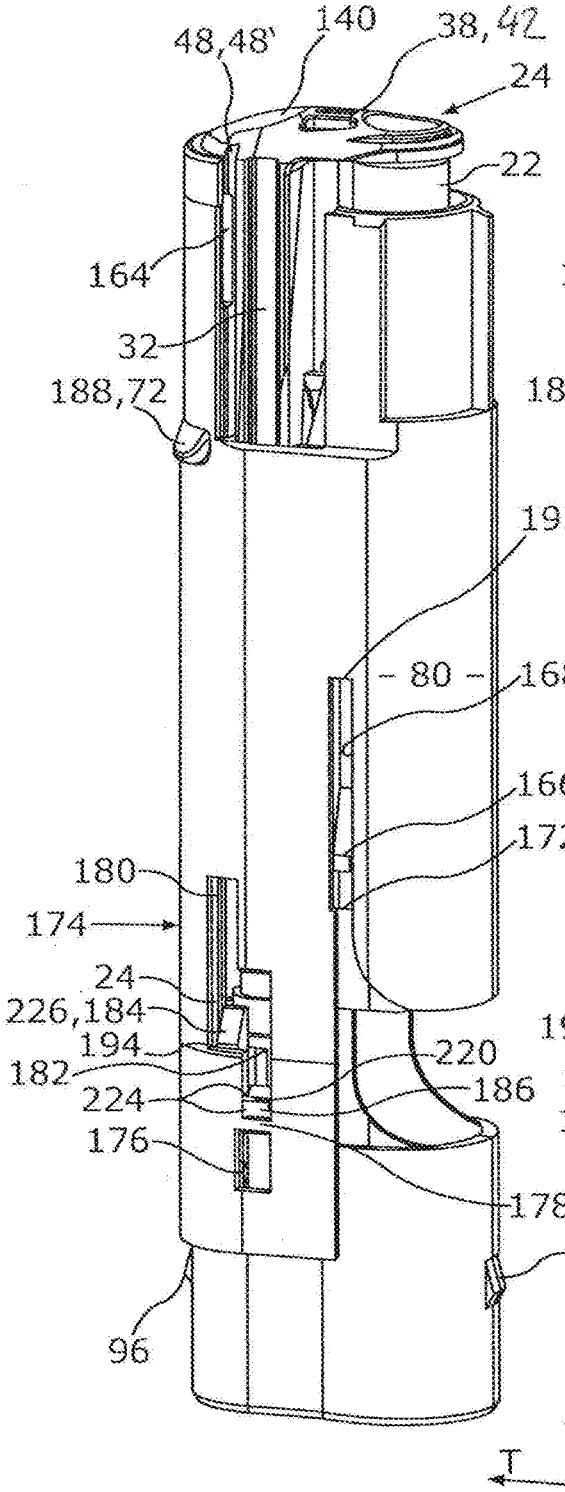


FIG. 10B

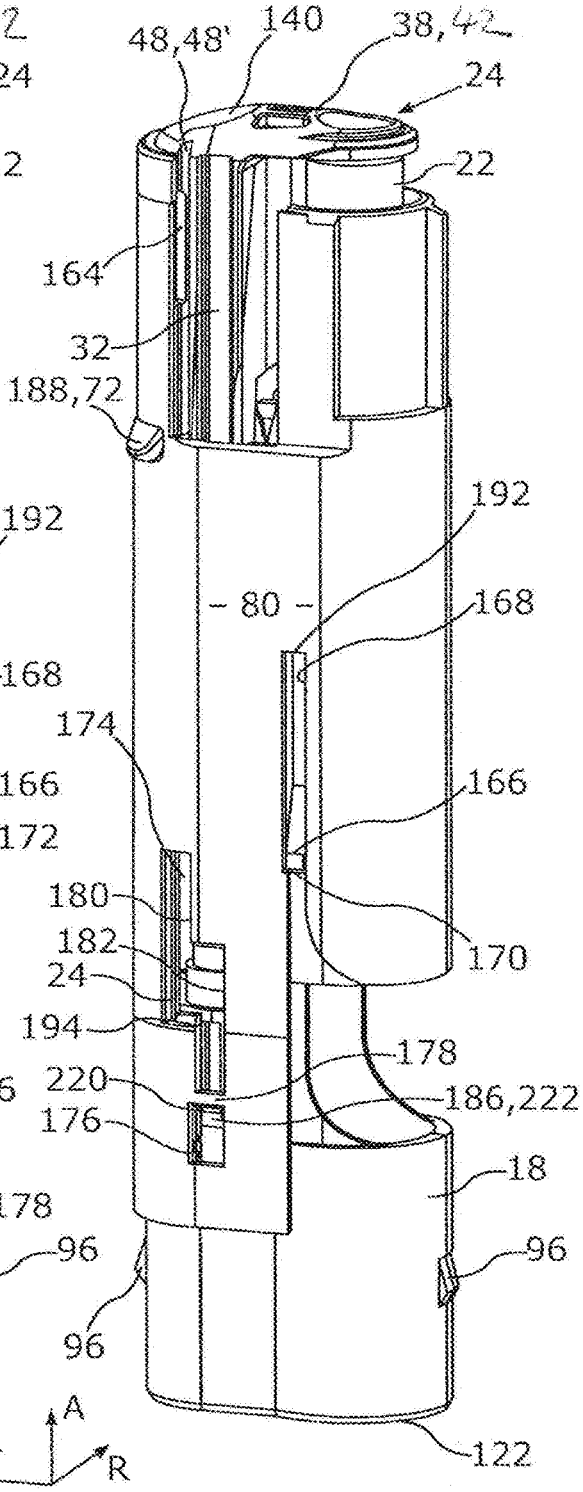


FIG. 11A

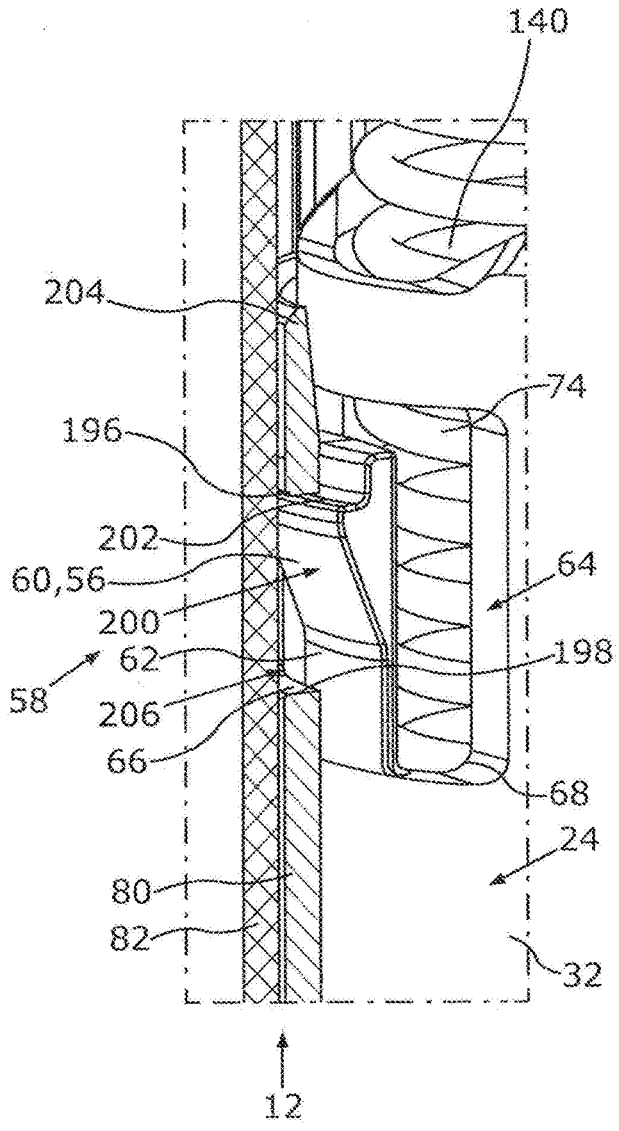
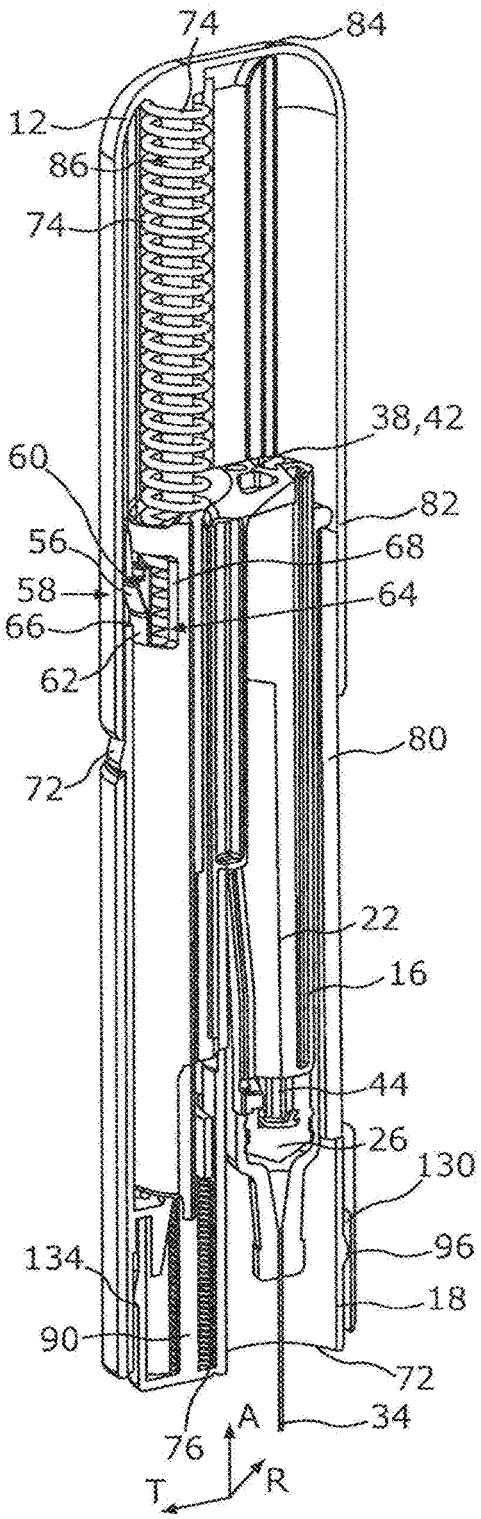


FIG. 11B



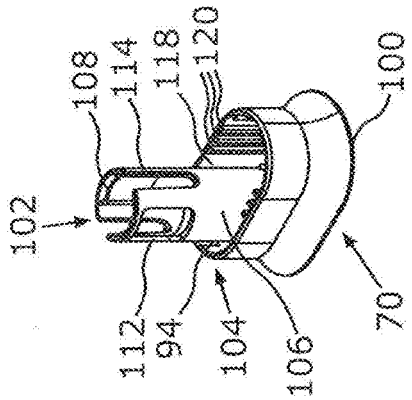


FIG. 12A

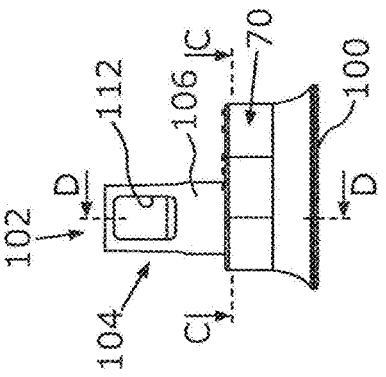


FIG. 12B

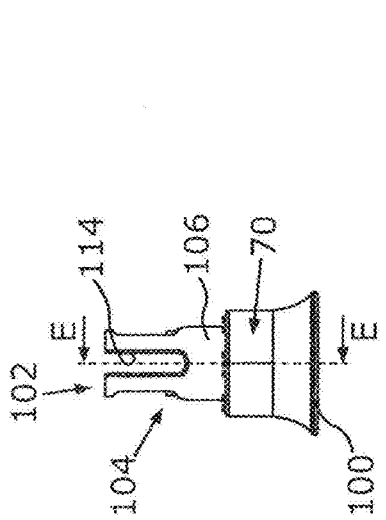


FIG. 12C

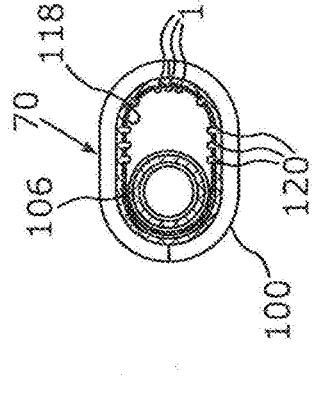


FIG. 12D

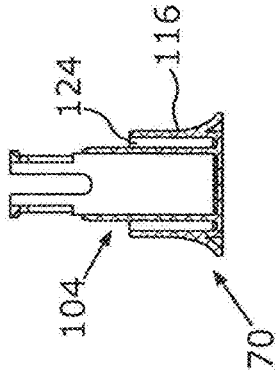


FIG. 12E

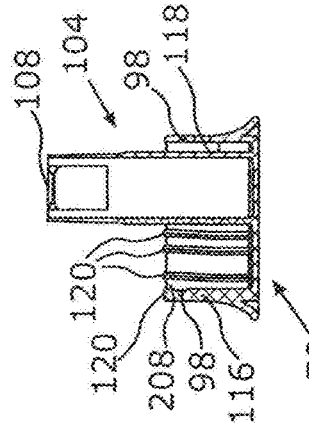
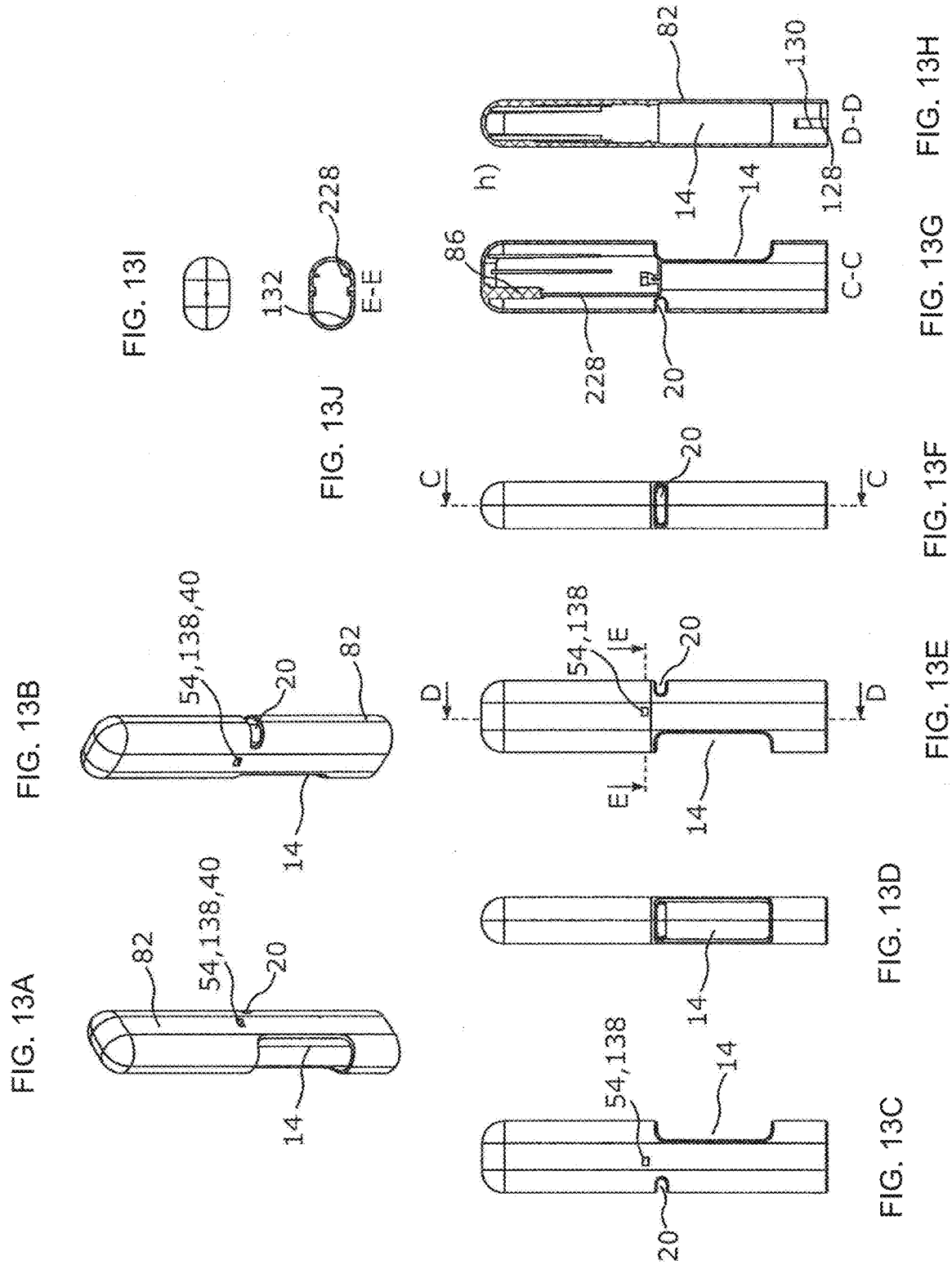
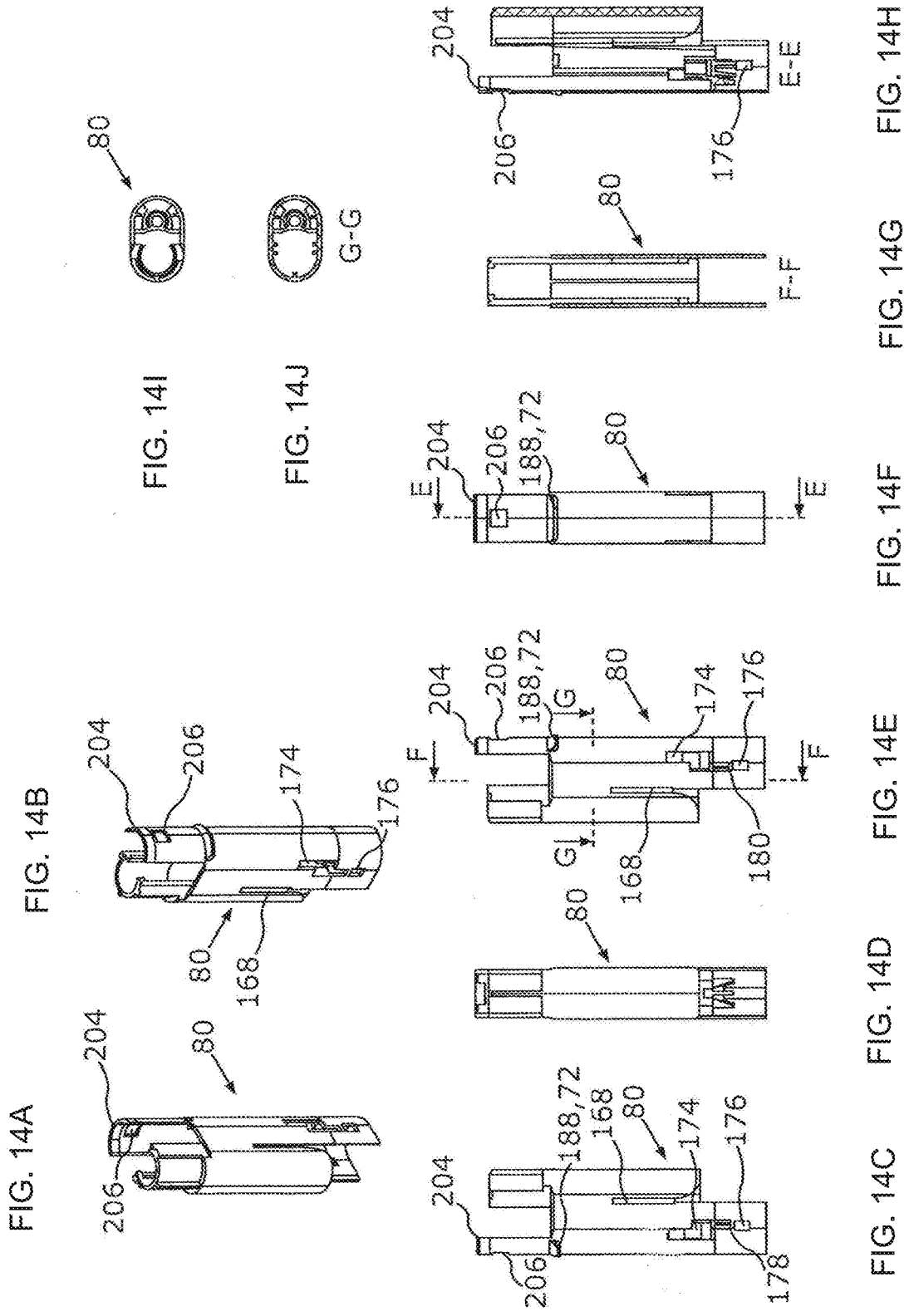
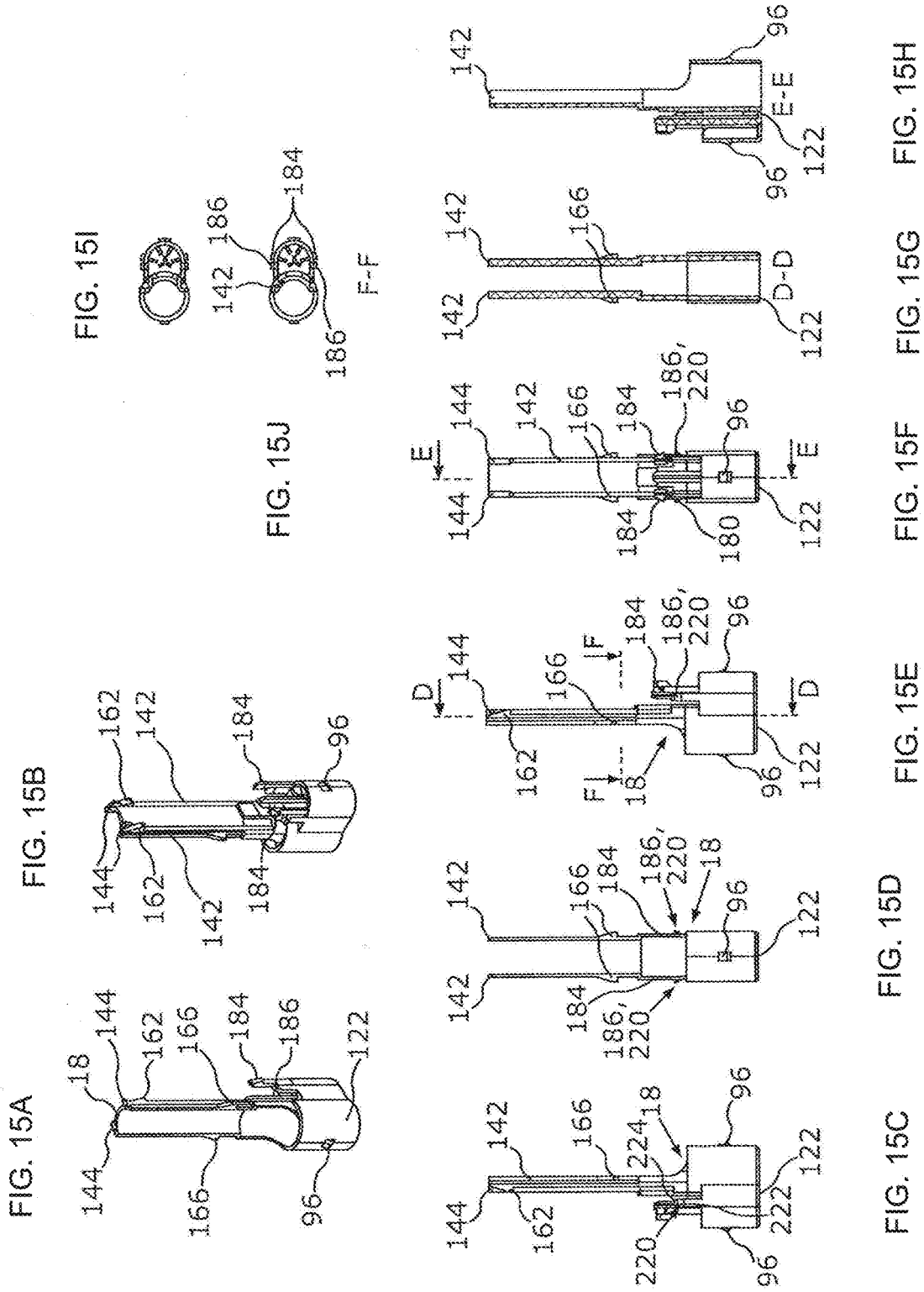


FIG. 12F


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FIG. 13G
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FIG. 14A
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FIG. 14J


FIG. 15A
FIG. 15B
FIG. 15C
FIG. 15D
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FIG. 15G
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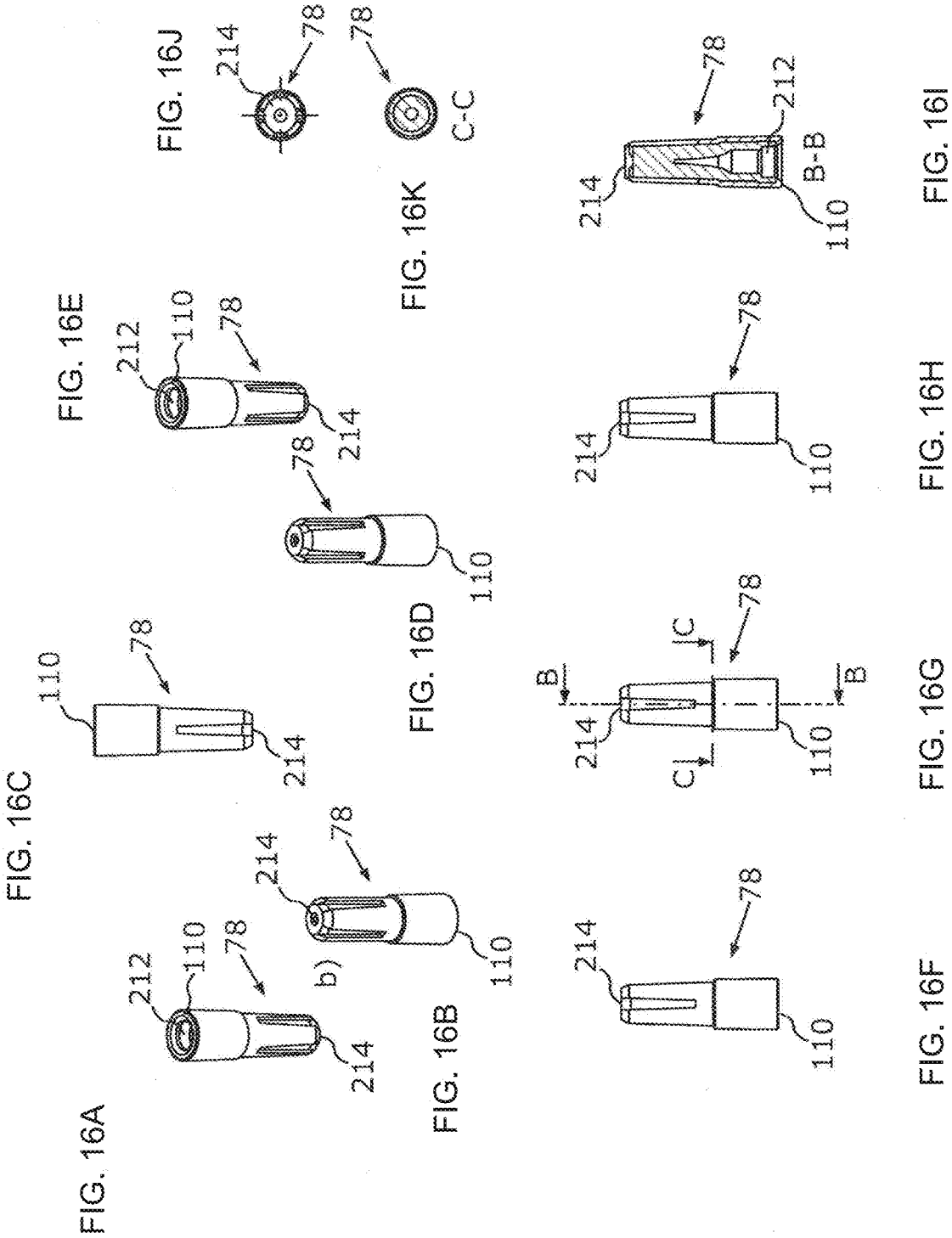
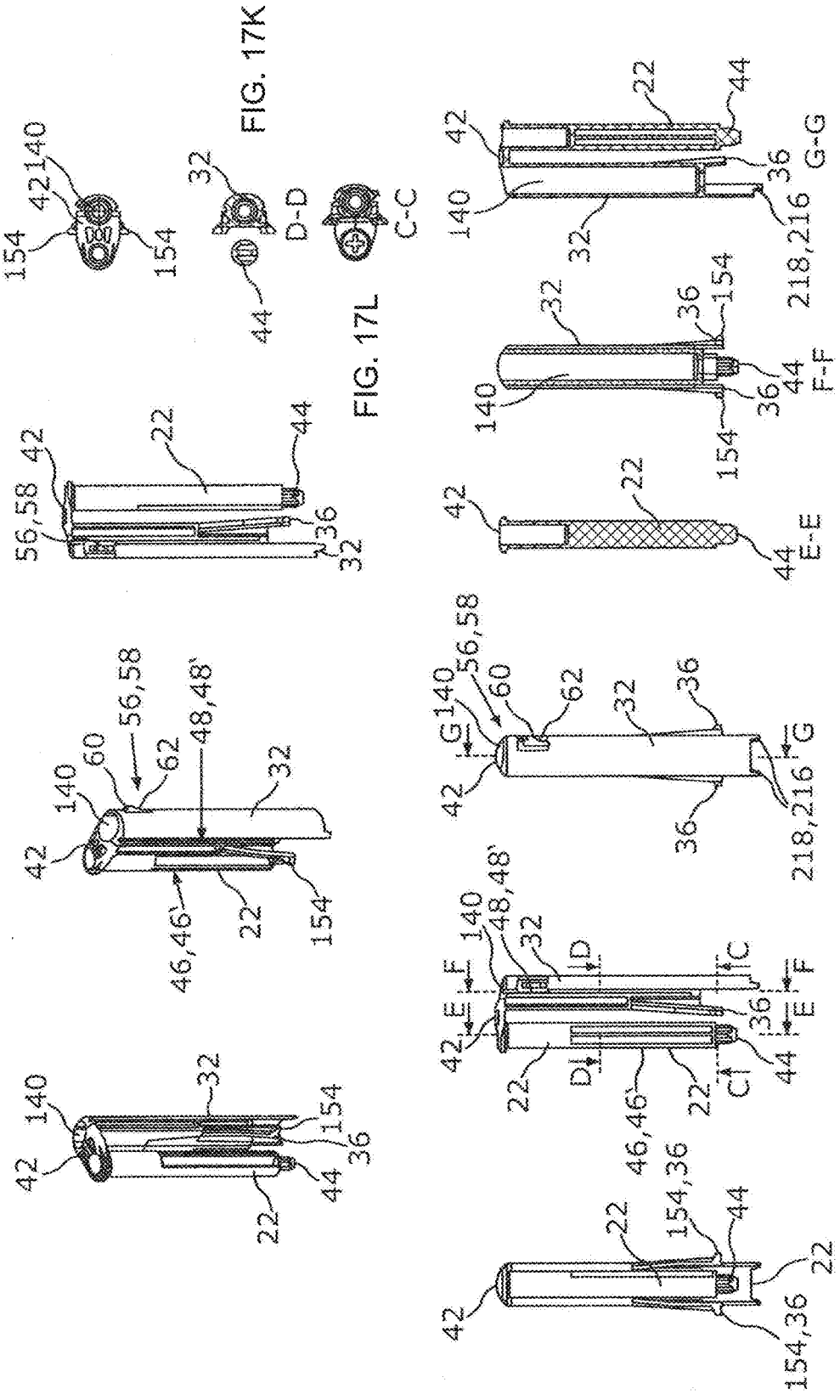


FIG. 16A FIG. 16B FIG. 16C FIG. 16D FIG. 16E FIG. 16F FIG. 16G FIG. 16H FIG. 16I FIG. 16J FIG. 16K


FIG. 17A
FIG. 17B
FIG. 17C
FIG. 17D
FIG. 17E
FIG. 17F
FIG. 17G
FIG. 17H
FIG. 17I
FIG. 17J
FIG. 17K
FIG. 17L
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AUTOINJECTOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a U.S. National Stage application of International Application No. PCT/EP2022/079992, filed Oct. 26, 2022, which claims priority to U.S. application Ser. No. 17/587,735, filed Jan. 28, 2022 and European Application No. 21205074.4, filed Oct. 27, 2021, the contents of which are hereby incorporated by reference.

BACKGROUND

Technical Field

[0002] The present disclosure relates to an autoinjector comprising a housing and a drive chassis arranged linearly moveable within the housing, the drive chassis comprising a dispensing limb and a trigger limb, wherein the trigger limb and the dispensing limb are arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal end of the dispensing limb and the trigger limb.

Background Information

[0003] Autoinjectors are typically disposable devices configured to dispense medicament from a pre-filled syringe. Such devices are single-use and intended for administration by a patient (i.e. self-administration) or carer. At point of use, the user removes a protective cap from the proximal end of the autoinjector and positions the autoinjector at the injection site (typically the skin of the thigh or belly) and presses the autoinjector axially in a proximal direction, to achieve needle insertion of a needle of the pre-filled syringe into the skin and to initiate dispense.

SUMMARY

[0004] It is an object of the present disclosure to make available an autoinjector formed from a very small number of low cost components and a very simple process, compared to the state of the art. It is a further object of the present disclosure to make available an as compact design as possible.

[0005] This object is satisfied by an autoinjector comprising the subject matter described herein.

[0006] Such an autoinjector comprises a housing and a drive chassis arranged linearly moveable within the housing, the drive chassis comprising a dispensing limb and a trigger limb, wherein a plunger is arrangeable at a proximal end of the dispensing limb and a trigger arm is arranged extending proximally from the trigger limb, wherein the trigger limb and the dispensing limb are arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal end of the dispensing limb and the trigger limb.

[0007] Due to the disposable nature of single-use autoinjectors, it is considered advantageous to minimise autoinjector complexity, material usage, package size and assembly complexity in this way, as this all tends to reduce cost and environmental impact, this is achieved by the autoinjector presented herein.

[0008] This is especially achieved by a reduction in the size of the device achieved by the parallel arrangement of the trigger limb and the dispensing limb of the drive chassis thereby leading to a reduction of the volume of raw materials used.

[0009] Moreover, since fewer parts are used one can reduce the cost of manufacturing equipment and simplify the assembly process.

[0010] Smaller devices also lead to a reduction of the volume required in transport and storage, which can be particularly expensive when low temperatures are required. This also reduces the carbon footprint associated with such autoinjectors.

[0011] In this connection it should be noted that the drive chassis is a component that can be configured to move in a straight line within the housing in order to drive a medicament stored in a pre-filled syringe arranged within the housing out of the pre-filled syringe on activation of the autoinjector by entraining the plunger of the pre-filled syringe in a manner known per se.

[0012] In this connection the dispensing limb can be a component of the drive chassis associated with dispensing the medicament from the pre-filled syringe, i.e. it can form a plunger rod, a plunger support or the like.

[0013] In this connection the trigger limb can be a component of the drive chassis associated with the process of triggering the autoinjector for a release of the drive chassis prior to dispensing the medicament, i.e. a component of the drive chassis cooperating with a release mechanism of the autoinjector.

[0014] In this connection the trigger arm can be a component of the release mechanism or a component that cooperates with the release mechanism of the autoinjector.

[0015] In this connection it should further be noted that the trigger arm can also extend in the radial and/or transverse direction relative to the trigger limb.

[0016] By forming the trigger limb and the dispensing limb in parallel to one another construction space can be saved as the prior art plunger limbs can be reduced significantly in length.

[0017] Moreover, forming a drive chassis in the aforementioned way also reduces the number of components as various functions of the drive chassis described herein are associated with individual parts in prior art drive chassis.

[0018] The trigger limb, the dispensing limb, the plunger and the trigger arm can be integrally formed in one piece. In this way a single component made of one and the same material can be made available with the single component being configured to carry out various functions for which individual components are required in prior art devices.

[0019] The trigger arm can be biased with respect to the housing of the autoinjector in a storage state of the autoinjector. The trigger arm can be a component of a release mechanism of the autoinjector configured to engage and disengage a further component in dependence on the state of use of the autoinjector, e.g. the storage state, the dispensing state and/or the lock-out state. On releasing this bias of the trigger arm, the autoinjector can be moved from the storage state to the dispensing state.

[0020] The trigger arm can be configured to be deflected relative to the housing and optionally relative to the trigger limb on moving the autoinjector from a storage state into a dispensing state of the autoinjector. In this way a component of the release mechanism can be moved in order to initiate a dispensing process of the autoinjector.

[0021] The autoinjector can further comprise a needle guard, wherein the trigger arm is actuated on by the needle guard of the autoinjector on moving the autoinjector from a storage state into a dispensing state of the autoinjector. In this way the design of the autoinjector can be further simplified and a further part of the autoinjector can have several functions associated therewith. The functions of the needle guard, on the one hand, are to guard a needle of the autoinjector before and after use, and, on the other hand, to form a part of the release mechanism of the autoinjector.

[0022] An outer surface of the trigger limb can comprise a first and a second part outer surface whose appearance differ from one another. In this way a visual communication of the end of the dose can be made available at the autoinjector using the drive chassis.

[0023] The autoinjector can further comprise a drive spring, wherein the drive spring can be arranged within the housing of the autoinjector between a distal housing wall and the drive chassis. The drive spring is utilized to automatically drive the medicament out of the autoinjector once the release mechanism of the autoinjector has been engaged and the spring bias is automatically released.

[0024] In this connection it should be noted that the drive spring can be biased with respect to the housing in the storage state of the autoinjector.

[0025] The drive spring can also bias the trigger arm in a storage state of the autoinjector with respect to the housing of the autoinjector. In this way a further component of the autoinjector can be used to satisfy several functions. Moreover, the inherent force stored in the drive spring can be used to lock the autoinjector prior to use thereof.

[0026] The trigger limb can be configured to receive at least a part of the drive spring. In this way the design of the autoinjector can be made as compact as possible and a length thereof can be reduced even further. By way of example, the trigger limb can comprise a passage configured to receive at least a part of the drive spring.

[0027] The drive spring can be configured to drive the plunger of the autoinjector into a pre-filled syringe of the autoinjector. In this connection it should be noted that the drive spring is arranged in parallel to, i.e. axially offset from the plunger of the pre-filled syringe.

[0028] The drive chassis can be linearly guided within the housing on moving the autoinjector from a storage state into a dispensing state of the autoinjector. By guiding the drive chassis within the housing a movement direction of the components of the autoinjector can be pre-defined and a frictional engagement of the parts can be tailored to one another.

[0029] The trigger arm can be configured to move radially and transversely with respect to the trigger limb. This provides several degrees of freedom regarding the movement of the trigger arm.

[0030] The trigger arm can be configured to cooperate with a stop feature arranged at the housing in a storage state of the autoinjector. In this way a release mechanism can be formed between the drive chassis and the housing of the autoinjector leading to a further reduction in the size and components of the autoinjector.

[0031] The trigger limb and the dispensing limb can be arranged in an at least generally U-shaped manner respectively in a U-shaped manner. Such a U-shaped design of the autoinjector leads to a reduction in the size of the autoinjector.

[0032] In this connection it should be noted that the trigger limb and the dispensing limb are arranged to extend, at least approximately, in the same starting from the web, axially offset from one another.

[0033] The trigger limb can further comprises at least a first part of an audible end of dose feedback member. In this way an audible communication can be given to a user on use of the autoinjector. Moreover, the drive chassis can satisfy a further function leading to a reduced size of the autoinjector.

[0034] The housing can optionally comprise at least a second part of the audible end of dose feedback member. In this way the design can be simplified and made more compact.

[0035] The first and second parts of the audible end of dose feedback members can be formed by an opening and a latching tongue configured to engage the opening. Such a component is simple in design, requires few parts and is simple to implement.

[0036] The audible end of dose feedback member can be configured to emit a sound once the material has been dispensed from the autoinjector. In this way an end of dose can be indicated to a user such that a user obtains feedback on a point in time where the autoinjector can be safely removed from the injection site with the knowledge that all medicament has been expelled.

[0037] The audible end of dose feedback member can be configured to emit a sound between the drive chassis and the housing once the material has been dispensed from the autoinjector. In this way the sound can be emitted between two parts moveable relative to one another in an as compact a design as possible.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] The disclosure will be described in more detail with reference to the drawings.

[0039] FIG. **1**A illustrates a side view of an autoinjector in a storage state, and FIG. **1**B illustrates a further side view of the autoinjector of FIG. **1**A in the storage state;

[0040] FIG. **2**A illustrates a side view of the autoinjector of FIG. **1**A in a dispensing state, and FIG. **2**B illustrates a further side view of the autoinjector of FIG. **1**A in the dispensing state;

[0041] FIG. **3** illustrates a side view of a drive chassis for an autoinjector;

[0042] FIG. **4**A illustrates the autoinjector of FIG. **1**A in the storage state, FIG. **4**B illustrates the autoinjector of FIG. **1**A in the activated state shortly before the dispensing state, and FIG. **4**C illustrates the autoinjector of FIG. **1**A in a lock-out state;

[0043] FIG. **5**A illustrates a view of a cap of the autoinjector, and FIG. **5**B illustrates a sectional view of the autoinjector in the region where the cap of FIG. **5**A is installed at the needle guard end of the autoinjector;

[0044] FIG. **6** illustrates a part sectional view of the autoinjector showing the cap installed at the needle guard end of the autoinjector;

[0045] FIGS. **7**A to **7**C illustrate part sectional views of the autoinjector, with a part of the housing removed, such that one can see components of a release mechanism of the autoinjector on activating the autoinjector;

[0046] FIGS. **8**A to **8**C illustrate detailed views of the release mechanism of the autoinjector of FIG. **7**;

[0047] FIGS. **9**A to **9**C illustrate respective front, side and top views of the release mechanism of FIG. **8**;

[0048] FIG. **10**A illustrates a view of the position of a needle guard of the autoinjector relative to the housing in the storage state and FIG. **10**B illustrates a view of the position of the needle guard of the autoinjector relative to the housing in the lock-out state;

[0049] FIG. **11**A illustrates a part sectional view of an audible feedback member of the autoinjector in the dispensing state at end of dose, and FIG. **11**B illustrates an enlarged view of the audible feedback member of the autoinjector in the dispensing state at the end of dose;

[0050] FIGS. **12**A to **12**F illustrate various views of an example of a cap of an autoinjector;

[0051] FIG. **13**A to **13**J illustrate various views of an example of an outer body of an autoinjector;

[0052] FIGS. **14** to **14**J illustrate various views of an example of an inner body of an autoinjector;

[0053] FIG. **15**A to **15**J illustrate various views of an example of a needle guard of an autoinjector;

[0054] FIGS. **16**A to **16**K illustrate various views of an example of a needle shield of an autoinjector; and

[0055] FIG. **17**A to **17**L illustrate various views of an example of a drive chassis of an autoinjector.

DETAILED DESCRIPTION

[0056] References made in the following regarding directions are made in the context of the drawing and can naturally vary if the viewing position is changed. Moreover, similar parts or parts having similar functions will be referred to in the following using the same feature and/or reference numeral.

[0057] FIGS. **1**A and **1**B illustrate side views of an autoinjector **10**. The autoinjector **10** is a medical instrument that serves the purpose of administering a single dose of medicament M. The autoinjector **10** can not only be used by medical staff, but also by a patient themselves to administer the medicament M.

[0058] The autoinjector **10** has a housing **12** with a syringe window **14** (see FIG. **1**A) present therein. A pre-filled syringe **16** is arranged within the housing **12** and visible via the syringe window **14**. The pre-filled syringe **16** is filled with the medicament M.

[0059] A needle guard **18** (see e.g. FIG. **2**A) is arranged at a proximal end **28** of the autoinjector **10**. The needle guard **18** has the function of protecting a patient from a needle **34** (see e.g. FIG. **3**B) before and after use of the autoinjector, i.e. in a storage state and in a lock-out state of the autoinjector **10**.

[0060] In this connection it should be noted that the terms proximal and distal refer to the position of the needle **34** relative to a patient with proximal meaning closest to a main mass of the body of a patient and distal meaning it is more distant from the main mass of the body of a patient.

[0061] FIG. **1**B illustrates a status indicator window **20** in which a first part outer surface **50** of a drive chassis **24** of the autoinjector **10** is visible.

[0062] A cap **70** is arranged at the proximal end **28** of the autoinjector **10** disposed opposite to a distal end **30** of the autoinjector **10**. The cap **70** covers both the needle **34** and the needle guard **18** in the storage state of the autoinjector **10**.

[0063] FIGS. **2**A and **2**B illustrate the autoinjector **10** of FIGS. **1**A and **1**B with the cap **70** removed and the needle guard **18** moved distally, i.e. moved away from the proximal end **28**, and into the autoinjector **10**. The distal movement of the needle guard **18** into the autoinjector also brings about an engagement of a release mechanism **40** (see e.g. FIG. **4**).

[0064] On engaging the release mechanism **40**, the drive chassis **24** (see also FIG. **3**) is moved proximally and a dispensing limb **22** thereof moves a plunger **26** through the pre-filled syringe **16** in order to dispense the medicament M via the needle **34**.

[0065] In this connection it should be noted that the plunger **26** can be a part separate from the dispensing limb **22** and can be pre-arranged within the pre-filled syringe and configured to be engaged by the dispensing limb **22**.

[0066] In other designs of the autoinjector **10**, the plunger **26** can be a part of the dispensing limb **22**.

[0067] FIG. **2**A illustrates the presence of the dispensing limb **22**, the drive chassis **24** and the plunger **26** in the syringe window **14** following the movement of the drive chassis **24** in the proximal direction, i.e. at an end of dose state of the autoinjector **10**.

[0068] FIG. **2**B illustrates a second part outer surface **52** of the drive chassis in the status indicator window **20**.

[0069] In the drawings shown above, the status indicator window **20** on the side of autoinjector **10** shows a device status in clear, binary form, which is likely to be very useful particularly to naïve users. Before (and possibly during) dispense, the colour displayed through the window is printed on the drive chassis **24** (see also FIG. **3**. At the end of the dispense, the moulded colour (indicated with the hashed lines) of the drive chassis **24** is displayed through the status indicator window **20**. Other configurations of display, for example employing graphics to indicate that dispense is in progress, icons or text, are possible.

[0070] Moreover, before dispense, the dispensable fluid volume of the medicament M is clearly visible through the syringe window **14** that is formed as a large wrap-around window in the housing **12**. The geometry of this window **14** is intended to maximise the viewing angle for the user.

[0071] The progress of the dispense can also be viewed through the window **20** as a movement of the plunger **26** and of the drive chassis **24** is visible through the syringe window **14**.

[0072] At the end of dispense, the syringe window **14** is filled with the drive chassis **24** and the plunger **26** to provide additional visual indication that the autoinjector **10** has been used. This means that two forms of different visual indication of the end of dose are present. The part of the drive chassis **24** visible through the syringe window **14** could be provided with a surface decoration or marking, e.g. printed in a different colour to provide further visual communication of the end of the dose.

[0073] FIG. **3** shows the drive chassis **24**. The drive chassis **34** comprises the dispensing limb **22** and a trigger limb **32**. The trigger limb **32** and the dispensing limb **22** are arranged in parallel to one another. The drive chassis **24** is a component that is configured to move in a straight line within the housing in order to drive the medicament M out of the pre-filled syringe on activation of the autoinjector **10**.

[0074] The trigger limb **32** and the dispensing limb **22** are arranged in an at least generally U-shaped manner respectively in a U-shaped manner and are connected to one another at a distal end **38** of the drive chassis **24** via a web **42**, i.e. axially offset from one another in the transverse direction T with a length of the trigger limb **32** being longer than a length of the dispensing limb **22**.

[0075] In this connection it should be noted that in other designs the dispensing limb **22** can also have the same length as the trigger limb **32** or even be longer than the trigger limb **32**.

[0076] A plunger support **44** is arranged at an end of the dispensing limb **22** remote from the web **42**. The plunger support **44** is configured to engage the plunger **26** that moves through the pre-filled syringe **16**, i.e. the plunger support **44** is configured to act on the pre-filled syringe **16** of the autoinjector **10** via the plunger **26** that is arranged within the pre-filled syringe **16**.

[0077] A trigger arm **36** is arranged to extend proximally from the trigger limb **32** in both a transvers direction T and a radial direction R relative to an axial direction A, with the axial direction A extending in parallel to the trigger limb **32**. The trigger arm **36** is arranged extending from the trigger limb **32** in a direction remote from the distal end **38**.

[0078] The trigger arm **36** is fixedly attached to the trigger limb **32** and moveable relative to the trigger limb **32**.

[0079] The trigger arm **36** is connected to the trigger limb at a position corresponding to a length of the trigger limb **32** corresponding to 20 to 80% of a length of the trigger limb **32** from the distal end **38**.

[0080] In this connection it should be noted that the drive chassis **24** is formed in one piece, i.e. the trigger limb **32**, the dispensing limb **22**, the plunger support **44** and the trigger arm **36** are integrally formed in one piece, preferably from one and the same material, e.g. in the same injection mold, or, if manufactured by additive manufacturing techniques, in one production cycle.

[0081] The drive chassis **24** can be installed in the autoinjector **10** shown in connection with FIGS. **1**A-lB and FIGS. **2**A-**2**B. The drive chassis **24** can then be linearly guided within the housing **12** of the autoinjector **10** on moving the autoinjector **10** from a storage state into a dispensing state of the autoinjector.

[0082] For this purpose, the drive chassis **24** can have first and second guiding aids **46**, **48** cooperating with corresponding structures present within the housing **12**. In the present example the first and second guiding aids **46**, **48** are formed by first and second grooves **46'**, **48'** that respectively extend in the axial direction A along the dispensing limb **22** respectively the trigger limb **32**. The first and second grooves **46'**, **48'** cooperate with lugs **164**, **228** (see e.g. FIG. **10**A respectively FIG. **13**G) present on an inside wall of the housing **12**.

[0083] Alternatively, the drive chassis **24** can comprise lugs cooperating with corresponding grooves in the housing **12** as the first and second guiding aids **46**, **48**.

[0084] Alternatively, the trigger limb **32** and the dispensing limb **22** can be shaped in such a way that they cooperate with guide structures present within the housing **12**, by way of example, the trigger limb **32** and the dispensing limb **22** can have a round outer shape in a cross-section therethrough perpendicular to the axial direction A, with the round outer shapes of the trigger limb **32** and the dispensing limb **22** then being guided in complementary shaped parts of the housing **12**.

[0085] In the storage state the trigger arm **36** is held at a stop feature **54** (see e.g. FIG. **4**A). On moving the autoinjector from the storage state into the dispensing state of the autoinjector, the trigger arm **36** is deflected out of engagement from the stop feature **54**. For this purpose, the trigger arm **36** is moveable relative to the trigger limb **32**, i.e. the position of the trigger arm **36** can be moved relative to the trigger limb **32**.

[0086] In this connection it should be noted that the stop feature **54** is arranged at a height along the axial direction A of the housing **12** corresponding to a length of 45% of the length of the housing **12** from the distal end **30** of the autoinjector **10**.

[0087] In this connection it should be noted that the stop feature **54** can be arranged at a height along the axial direction A of the housing **12** selected in the range of 30 to 70% of the length of the housing **12** from the distal end **30** of the autoinjector **10**.

[0088] In this connection it should be noted that the trigger arm **36** is configured to move radially in the radial direction R and transversely in the transverse direction T with respect to the trigger limb **32**.

[0089] The trigger limb **32** has an outer surface **49** comprising the first part outer surface **50** (hashed surface) and the second part outer surface **52** (black outer surface). The first and second part outer surfaces **50**, **52** are present at a transverse side of the trigger limb **32**, i.e. pointing in the transverse direction T. The first and second part outer surfaces **50**, **52** are visible via the status indicator window **20** in different states of use of the autoinjector **10**.

[0090] Specifically, as indicated in FIG. **1**B, the first part outer surface **50** is visible via the status indicator window **20** in the storage state of the autoinjector **10** and the second part outer surface **52** is visible via the status indicator window **20** in the dispensing state towards an end of dose and in the lock-out state of the autoinjector **10** following an end of dose.

[0091] A first limb of the U-shaped drive chassis **24** is formed by the dispensing limb **22** and a second limb of the U-shapes drive chassis **24** is formed by the trigger limb **32**.

[0092] A distal end of the syringe window **14** is arranged at approximately the same height as a distal end of the status indicator window **20**. The syringe window **14** and the status indicator window **20** are arranged in a part of the housing **12** where an inner body **80** and an outer body **82** (see FIGS. **4**A-**4**C) overlap. The third part of the drive chassis **24** that can be visible in the syringe window **14** is the dispensing limb **22** in addition to which the plunger **26** of the pre-filled syringe **16** is also visible.

[0093] In this connection it should be noted that the first and second parts **50**, **52** of the drive chassis **24** are not visible in the syringe window **14**.

[0094] So that a user (not shown) can distinguish between the different states of use, i.e. between the first and second part outer surfaces **50**, **52**, the appearances of the first and second part outer surfaces **50**, **52** differ from one another, i.e. these are different from one another.

[0095] In the present example the second part outer surface **52** comprises a marking printed thereon in the form of a hashed structure, other kinds of surface decorations and/or markings can be employed. The first part outer surface **50** is e.g. formed in the same colour as the remaining drive chassis **24**, however, can also have some other colour comprise some form of surface marking and/or decoration or other form of visual indicator.

[0096] By way of example words such as "full and/or ready" and "empty and/or used" could printed on the first and second part outer surfaces **50**, **52**. Additionally and/or

alternatively the first and second part outer surfaces **50**, **52** can be coloured differently from one another, e.g. in red or green or the like.

[0097] The autoinjector **10** shown in FIGS. **4**A to **4**C comprises the needle guard **18** the removable cap (only FIG. **4**A), the pre-filled syringe **16** arranged within the housing **12**, a drive spring **74**, a lock-out spring **76**, and a removable needle shield **78** (RNS).

[0098] FIG. **4**A illustrates the autoinjector **10** of FIG. **1**A in the storage state, FIG. **4**B illustrates the autoinjector **10** of FIG. **1**A in the activated state shortly before the dispensing state, and FIG. **4**C illustrates the autoinjector **10** of FIG. **1**A in the lock-out state.

[0099] In the storage state of the autoinjector **10**, a cap **70** is installed at the proximal end **28** of the autoinjector **10**. On removal of the cap **70**, the needle guard **18** of the autoinjector **10** becomes accessible.

[0100] The needle guard **18** is mounted axially moveable in the housing **12** for movement between the storage state, the dispensing state and the lock-out state. The needle guard **18** adopts different axial positions relative to the housing **12** in each one of the storage state, the dispensing state and the lock-out state.

[0101] As indicated in FIG. **4**B, the needle guard **18** is moved in the distal direction along the axial direction A to make the needle **34** accessible from the outside, i.e. so that a patient can insert the needle **34** into his skin.

[0102] The needle guard **18** can be moved automatically in the distal direction along the axial direction A as the patient moves the autoinjector **10** towards the injection point, as the contact with the patients' skin will automatically move the needle guard into the housing **12** of the autoinjector **10**. For this purpose, the needle guard **18** is configured to be axially moved in the distal direction between the storage state and the dispensing state.

[0103] On moving the needle guard from the storage state into the dispensing state the lock-out spring **76** is biased between the needle guard **18** and an inner body **80** of the housing **12**.

[0104] Once a medicament M has been administered, i.e. dispensed from the autoinjector **10**, the needle guard **18** is configured to be axially moved in the proximal direction between the dispensing state and the lock-out state on removing the autoinjector **10** from the injection site. This movement of the needle guard **18** is automatically brought about by a relaxation of the lock-out spring **76**.

[0105] The housing **12** is a two-part housing formed of the inner body **80** and an outer body **82** that are fixed in position relative to one another and that are snap fit to one another via a connection **72**.

[0106] As shown in FIG. **4**B, the connection **72** is formed by a nose **188** formed at the inner body that is configured to latch to a window **190** formed in the outer body **82**.

[0107] In this connection it should be noted that the connection **72** can also be brought about via a different kind of connection. For example, the nose **188** can be formed at the outer body **82** and project towards the inner body **80** and engage the window **190** then formed at the inner body **80**, alternatively different forms of connector can be used to form the connection **72**.

[0108] The trigger arm **36** is actuated on by the needle guard **18** of the autoinjector **10** on moving the autoinjector **10** from the storage state into the dispensing state of the autoinjector **10**. As can be seen from a comparison of FIGS. **4**A and **4**B, the trigger arm **36** is deflected in the transverse direction T. Moreover, the trigger arm **36** is also deflected in the radial direction R.

[0109] The drive spring **74** is arranged within the housing **12** of the autoinjector **10**. The drive spring **74** is specifically arranged between a distal housing wall **84** and the drive chassis **24**. More specifically the drive spring **74** is arranged between the distal housing wall **84** of the outer body **82** and within the trigger limb **32** of the drive chassis **24**. In order to fix a position of the drive spring **74** this can be arranged at a projection **86** projecting proximally from the distal housing wall **84** of the outer body **82**.

[0110] The drive spring **74** is received within a passage **140** formed in the trigger limb **36** of the drive chassis **24**. This means that the trigger limb **36** is configured to receive the drive spring **74**. In the present example, the passage **140** has a cylindrical shape that is complementary to an outer shape of the drive spring **74**.

[0111] As can be seen from a comparison of FIGS. **4**A, and **4**B with FIG. **4**C the drive spring **74** is relaxed in comparison to the other two states in the lock-out state. This is because a release of the engagement between the trigger arm **36** and the stop feature **54** permits a proximal movement of the drive chassis **24** relative to the housing, i.e. relative to the inner and outer bodies **80**, **82** under relaxation of the previously biased drive spring **74**.

[0112] The drive spring **74** also biases the trigger arm **36** in the storage state of the autoinjector **10** with respect to the housing **12** of the autoinjector **10** by urging this against the stop feature **54** by the inherent spring bias of the drive spring **74**.

[0113] The drive spring **74** is further configured to drive the plunger support **44** of the drive chassis of the autoinjector **10** into the pre-filled syringe **16**. This is due to the fact that the drive chassis **24** is linearly guided within the housing **12** and is permitted to move proximally once the trigger arm **36** is released from its engagement with the stop feature **54**.

[0114] The needle guard **18** surrounds the needle **34** of the pre-filled syringe **16** in the storage state and in the lock-out state. Once the cap **70** is removed and the autoinjector **10** has been moved into the dispensing state, the needle guard **18** does not surround the needle **34** of the pre-filled syringe **16**.

[0115] As indicated in FIGS. **4**A to **4**C, the autoinjector **10** further comprises the lock-out spring **76** that is arranged between the needle guard **18** and the housing **12**, more specifically between the inner body **80** and the needle guard **18**.

[0116] The lock-out spring **76** is biased between an end wall **88** of the needle guard **18** and a proximal end **92** of the inner body **80**. The end wall **88** is arranged proximally with respect to the inner body **80** and the drive chassis **24**.

[0117] Moreover, the needle guard **18** comprises a projection **90** projecting distally from the proximal end **28**. The lock-out spring **76** is arranged at the projection **90**, in particular, the projection **90** projects into the lock-out spring **76**.

[0118] The needle guard **18** is configured to compress the lock-out spring **76** on moving between the storage state and the dispensing state. This is possible as the lock-out spring **76** abuts a proximal end **92** of the inner body **80** of the autoinjector **10** and the projection **90** is guided through an aperture **91** present in the inner body **80**.

[0119] Following a use of the autoinjector **10** and removal of the autoinjector from an injection site, the needle guard **18**

is configured to be moved by a relaxation of the lock-out spring **76** between the dispensing state and the lock-out state in a proximal direction.

[0120] In this connection it should be noted that the projection **90** could also be provided at the inner body **80** such that it projects towards the proximal end **28** of the needle guard **18**. If this option is selected, then a length of the projection **90** has to be adapted such that the projection does not prevent a movement of the needle guard in the distal direction and/or such that it does not project beyond the needle guard **18** in the dispensing state so as to not come into contact with a patient's skin, e.g. if it cooperates with an aperture (not shown) of the needle guard **18**.

[0121] In the storage state of the autoinjector **10**, the needle guard **18** is arranged at a first axial position. In the dispensing state the needle guard **18** is arranged at a second axial position and in the lock-out state the needle guard **18** is arranged at a third axial position. The first, second and third axial positions respectively differ from one another, with the third axial position being more proximal than the first and second axial positions and the first axial position being more proximal than the second axial position with respect to the housing **12**.

[0122] In this connection it should be noted that the third axial position can be the same or very similar to the first axial position in other designs of the autoinjector **10**.

[0123] This means that an outer length of the autoinjector **10** with the cap **70** removed is longest in the lock-out state, shortest in the dispensing state and of medium length in the storage state.

[0124] FIG. **5**A illustrates a perspective view of the removable cap **70**. The cap **70** is of single piece design. The needle guard **18** is configured to cooperate with the cap **70** via one or more snap-fit connections **94**, wherein each snap fit connection **94** comprises a protruding edge **96** (see e.g. FIG. **6**) cooperating with a corresponding snap-fit area **98**.

[0125] In this connection it should be noted that each of the following components can be respectively integrally formed in one piece, preferably from one and the same material, e.g. in the same injection mold, namely the outer body **82**, the inner body **80**, the drive chassis **24**, the needle guard **18**, the cap **70**, and/or the needle shield **78**.

[0126] As shown in FIG. **5**A, the removable cap **70** has a base **100**. The cap **70** tapers outwardly in the region of the base **100** such that the base **100** of the cap **70** has a larger outer diameter than the remaining cap **70**. This is particularly beneficial as the base **100** can act as a stand for the autoinjector **10** in the storage state of the autoinjector **10**.

[0127] A needle guard facing end **102** of the cap **70** comprises a needle shield holder **104** at an end of the cap **70** disposed opposite to the base **100**. The needle shield holder **104** is configured to hold the removable needle shield **78** covering the needle of the pre-filled syringe **16** in the storage state of the autoinjector **10**.

[0128] The inner wall **106** of the needle shield holder **104** further comprises two windows **112**. A respective one of the inwardly facing projections **108** is arranged at each of the windows **112**.

[0129] Two recesses **114** are formed in the inner wall **106** of the needle shield holder **104** of the cap **70**. The recesses are arranged between respective parts of the needle shield holder **104** having the windows **112**.

[0130] The needle shield holder **104** projects distally from the base **100** of the cap **70** and is surrounded by an outer wall **116** of the cap **70**. An inner surface **118** of the outer wall **116** of the cap **70** comprises several ribs **120**.

[0131] As indicated in FIG. **5**B, a front end **122** of the needle guard **18** is arranged within an opening **124** of the cap **70**. The opening **124** is formed between the outer wall **116** of the cap **70** and the needle shield holder **104**.

[0132] The ribs **120** are configured to press radially inwardly, i.e. in the radial direction R, and transversely inwardly, i.e. in the transverse direction T, against the needle guard **18** in the storage state of the autoinjector **10**.

[0133] As also shown in FIG. **5**B the removable needle shield **78** is arranged within the needle shield holder **104**. For this reason, an inner wall **106** of the needle shield holder **104** comprises inwardly facing projections **108** at the needle guard facing end **102** that engage a syringe facing surface **110** of the needle shield **78**.

[0134] As indicated in FIG. **6** the protruding edges **96** are provided at an outer surface **126** of the needle guard **18**. The snap-fit areas **98** are provided at the inner surface **118** of the cap **70**.

[0135] The snap-fit connection **94** holds the cap **70** in place in the storage state of the autoinjector. The cap **70** is removably connected to the needle guard **18** and, on removal of the cap **70**, the needle shield **78** is also removed from the autoinjector **10**, as the projections **108** of the cap press on the syringe facing surface **110** of the removable needle shield **78** to entrain the removable needle shield in the proximal direction on removal of the cap **70**.

[0136] In order to permit an as compact as possible design of the autoinjector **10**, an inner surface **128** of the outer body **82** comprises a groove **130** in which one of the protruding edges **96** can axially move relative to the outer body **82** on an axial movement of the needle guard **18**.

[0137] Similarly, an inner surface **132** of the inner body **80** comprises a further groove **134** in which a further one of the protruding edges **96** can axially move relative to the inner body **80** on an axial movement of the needle guard **18** relative to the housing **12**.

[0138] The snap-fit projection **96** thereby forms detent features on the needle guard **18** that engage with corresponding features on the cap in order to provide a tight axial fit between the components following assembly.

[0139] A reverse arrangement of the detent features can also be possible, e.g. snap-fit areas can be present at the housing **12** and corresponding snap-fit projections could be present at the cap **70**.

[0140] The proximal side of these detent features (snap-fit projections **96**) on the needle guard is relatively steep, i.e. the proximal side of the snap-fit projections **96** is steeper than the distal side of the snap-fit projections **96** in the axial direction, so that once the cap **70** is removed, if the user attempts to re-attach it, the force to re-engage the detent features is high enough to cause the needle guard **18** to be moved distally until the detent features are hidden within the housing **12**.

[0141] In this way, re-attachment of the detent features will not be possible (although the cap can be held in place by the engagement of the RNS **78** and the syringe glass). The distance by which the needle guard **18** is moved in order to hide the detent features is designed to be less than the distance required to trigger dispense, so that attempted re-attachment of the cap **70** in this way does not trigger dispense.

[0142] When the cap **70** is attached to the autoinjector **10**, i.e. to the needle guard **18** via the snap-fit connection **94**, the cap **70** prevents axial movement of the needle guard **18** when attached to the needle guard **18** in the storage state.

[0143] As further indicated in FIG. **6** the outer wall **116** of the cap **70** contacts an outer wall **136** of the housing **12** in the storage state of the autoinjector **10**. The outer wall **116** of the cap **70** and the outer wall **136** of the housing **12** do not overlap in an axial direction A of the autoinjector **10**. Moreover, the outer wall **116** of the cap **70** and the outer wall **136** of the housing **12** radially overlap in the storage state of the autoinjector **10**.

[0144] It should be noted in this connection that the outer wall **136** of the housing is the outer wall **136** of the outer body **82** forming a part of the two-part housing **12**.

[0145] Clip features in the form of the projections **108** on the cap **70** act on the distal surface of the rigid needle shield (RNS) **78** to grip onto it and remove it from the pre-filled syringe **16** when the cap **70** is pulled off by the user.

[0146] In this connection it should be noted that a 'three plate tool' construction can be used to mould the cap **70**, including the clip features (projections **108**) in a single component in a common injection mold (not shown) where state of the art devices typically construct similar caps from two or more separate components.

[0147] The projections **108** are supported by the needle guard **18** during removal of needle shield **78**, helping to prevent them from splaying outwards and disengaging, as the needle shield holder **104** is biased radially inwardly by the needle guard **18**.

[0148] FIGS. **7**A to **7**C illustrate part sectional views of the autoinjector **10**, with a part of the housing **12** removed, such that one can see components of the needle guard **18**, the drive chassis **24**, the pre-filled syringe **16** and the housing **12** on activating the autoinjector **10**.

[0149] These Figures illustrate a distal movement of the needle guard **18** into the housing **12** and how this then engages the release mechanism **40** comprising the trigger arm **36** and the stop feature **54** before the drive chassis **24** is moved proximally in order to administer the medication M stored in the pre-filled syringe **16**.

[0150] The needle guard **18** comprises a plunger arm **142** as part of the release mechanism **40** of the autoinjector **10**. The plunger arm **142** extends distally from the front end **122** of the needle guard **18**.

[0151] As can be seen the relative position of the plunger arm **142** relative to the housing **12** varies and a distance the needle guard **18** projects beyond the housing **12** at the proximal end **28** reduces between FIGS. **7**A to **7**C.

[0152] FIGS. **8**A to **8**C illustrate detailed views of the different positions of the release mechanism **40** of the autoinjector **10** corresponding to the views shown in FIGS. **7**A to **7**C.

[0153] FIG. **8**A illustrates an enlarged view of the components of the release mechanism **40** of the autoinjector **10** which comprises the trigger arm **36** of the drive chassis **24**, and the stop feature **54** present in an opening **138** of the housing **12** with which the trigger arm **36** cooperates.

[0154] In this connection it should be noted that the opening **138** of the housing **12** is indicated as a through-going opening, i.e. it is open both at an outer wall of the housing **12** as well as an inner wall of the housing **12**. It should however be noted that it can also be formed as a recess in the inner wall of the housing **12** such that it does not go through the wall of the housing **12**.

[0155] The drive chassis **24** is mounted in the housing **12**, the drive chassis **24** is biased with respect to the housing **12** via the drive spring **74**. The drive chassis **24** is further fixed with respect to the housing **12** and a movement relative to the housing **12** in the storage state of the autoinjector **10** via the trigger arm **36** that is held at the opening **138**.

[0156] In the storage state of the autoinjector **10**, the drive spring **74** biases the trigger arm **36** in the axial direction A against the stop feature **54**. The trigger arm **36** is present at the right hand side in the opening **138** (of the present Figure).

[0157] In order to activate the autoinjector **10** and to release the drive chassis **24** for its proximal movement, the autoinjector **10** comprises the release mechanism **40**.

[0158] The release mechanism permits a relative movement between the needle guard **18** and the drive chassis **24**. This relative movement is achieved by an axial movement of the needle guard **18** towards the drive chassis **24** which releases the fixing of the drive chassis **24** with respect to the housing **12** on activation of the autoinjector **10**.

[0159] For this purpose the plunger arm **142** is configured to cooperate with the trigger arm **36** of the drive chassis **24** for activation of the release mechanism **40**. On moving the plunger arm **142** in the distal direction the plunger arm **142** contacts and thereby deflects the trigger arm **36** in the transverse direction T as indicated by the arrow B and a comparison of the position of the trigger arm **36** relative to the opening **138** shown in FIGS. **8**A to **8**C.

[0160] The plunger arm **142** of the needle guard **18** comprises a blocking rib **144**. The blocking rib **144** is configured to block a radial movement of the trigger arm **36** when the plunger arm **142** contacts the trigger arm **36**.

[0161] In this connection it should be noted that the blocking rib **144** is also configured to block a radial movement of the trigger arm **36** during the storage state prior to the plunger arm **142** contacting the trigger arm **36** due to an axial movement of the needle guard **18**.

[0162] In order to engage the trigger arm **36**, the plunger arm **142** comprises a cam **162**. The cam **162** has an engagement surface **146** configured to engage the trigger arm **36**. The engagement surface **146** projects from the cam **162** of the plunger arm **142** at a position adjacent to the blocking rib **144** in the transverse direction T such that it faces the trigger arm **36**.

[0163] The trigger arm **36** comprises a web **148**. The web **148** extends axially (proximally) below the projection **154** from the trigger arm **36** and provides a contact surface in the transverse direction T facing the cam **162** of the plunger arm **142** for engagement with the cam **142** following axial (distal) movement of the needle guard **18**.

[0164] On distally moving the needle guard **18**, the engagement surface **146** engages the web **148**. This means that the web **148** and the engagement surface **146** are provided to further facilitate the contact between the trigger arm **36** and the plunger arm **142**.

[0165] In a non-shown embodiment, the web **148** can comprise a deflection surface **150** inclined with respect to the trigger arm **36** relative to the axial direction A, i.e. a movement direction of the drive chassis **24**.

[0166] In this connection it should be noted that the deflection surface **150** can be inclined with respect to the

axial direction A at an angle selected in the range of 0 to 40°, especially in the range of 5 to 35° and most preferably in the range 10 to 30°.

[0167] The engagement surface **146** is also inclined with respect to a movement direction of the drive chassis **24**, i.e. with respect to the axial direction A. The engagement surface **146** is inclined to gradually deflect the trigger arm **36** in the direction transverse to the axial direction A of movement of the needle guard **18** in order to shift the trigger arm **36** from the right hand side of the opening **138** of FIG. **8**A to the left hand side of the opening **138** of FIG. **8**C.

[0168] In this connection it should be noted that the engagement surface **146** can be inclined with respect to the trigger arm **36** at an angle selected in the range of 5 to 50°, especially in the range of 7 to 30° and most preferably in the range 8 to 20°.

[0169] In this connection it should be noted that the engagement surface **146** and the web **148** are arranged to face one another in a cooperating manner.

[0170] When the engagement surface **146** contacts the web **148** respectively the deflection surface **150**, the trigger arm **36** is configured to be moved, in particular disengaged, from the stop feature **54**, through a deflection in the direction of the arrow B.

[0171] The opening **138** at which the stop feature **54** is arranged comprises a surface **152** that has a convex shape. The trigger arm **36** is configured to cooperate with the convex surface **152** of the stop feature **54**.

[0172] For this purpose, the trigger arm **36** comprises a projection **154** engaging the stop feature **54**. The projection **154** is configured to cooperate with the opening **138** by engaging into this and by resting on the surface **152** of the stop feature **54** at least in the storage state of the autoinjector **10**.

[0173] The web **148** is arranged at a surface of the trigger arm **36** different from a surface at which the projection **154** of the trigger arm **36** is arranged. The projection **154** is arranged to project radially from the trigger arm **36**, whereas the web **148** is arranged to project transversely from the trigger arm **36**.

[0174] FIG. **8***c* shows a state in which the engagement surface **146** of the blocking rib **144** of the plunger arm **142** has moved distally in the axial direction A beyond the axial position of the projection **154**, the trigger arm **36** has been deflected in the transverse direction T towards the left hand side of the opening **138** and also radially inwardly in the radial direction R and out of engagement with the stop feature **54**.

[0175] FIG. **8**C illustrates the state in which the needle guard **18** has been moved distally with respect to the previous figures, i.e. the autoinjector **10** is illustrated in the dispensing state just before the drive spring **74** urges the drive chassis **24** proximally in the axial direction A, as the trigger arm **36** has been released from engagement with the stop feature **54**.

[0176] FIG. **9**A illustrates a front view of the opening **138** of FIG. **8**B where the projection **154** is arranged at an apex **160** of the surface **152**.

[0177] As discussed in the foregoing, the stop feature **54** comprises the convex surface **152** formed by first and second planar surfaces **156**, **158** inclined with respect to one another. The first and second planar surfaces **156**, **158** adjoin one another at the apex **160** formed therebetween.

[0178] In this connection it should be noted that an angle of inclination between the first and second planar surfaces **156**, **158** is selected in the range of 110 to 175°, preferably in the range of 120 to 170° and especially in the range of 130 to 165°.

[0179] In this connection it should further be noted that an angle between the first planar surface **156** and the axial direction A is selected in the range of 0 to 50°, especially in the range of 1 to 30° and most preferably in the range of 2 to 20°.

[0180] In this connection it should further be noted that an angle between the second planar surface **158** and the axial direction A is selected in the range of −20 to 20°, especially in the range of −10 to 10° and most preferably in the range of −5 to 5°.

[0181] The apex **160** forms an overhauling angle the trigger arm **36** faces on activation of the autoinjector **10** in order to shift this from the storage state into the dispensing state.

[0182] In this connection it should be noted that the faces of the trigger arm can preferably be inclined and angled in such a way that the inclination and angle matches the angles and inclinations of the first and second planar surfaces **156**, **158**. In this way a contact area between the first and second planar surfaces **156**, **158** can be maximised providing an improved attachment between the respective surfaces particularly in the storage state.

[0183] FIG. **9**A illustrates a first view of the release mechanism **40** having the trigger arm **36** of FIGS. **8**A to **8**C cooperating with the stop feature **54**. FIG. **9**B illustrates a second view of the release mechanism **40** and especially the cooperation of the trigger arm **36** with the stop feature **54** in a view perpendicular to that shown in FIG. **9**A.

[0184] In the storage state the blocking rib **144** is configured to block a radial movement of the trigger arm **36**, as it forms a wall against which the trigger arm **36** abuts in the event that the trigger arm **36** is urged radially inwardly in a non-permitted manner, e.g. from the outside of the opening **138** when the plunger arm **142** contacts the trigger arm **36**.

[0185] In this storage state the drive spring **74** urges the drive chassis **24** in the axial direction A and the drive chassis **24** is axially held in position at the opening **138** via the protrusion **154** of the trigger arm **36**.

[0186] More specifically, the protrusion **154** is so to say held in the acute space formed by the first planar surface **156** of the stop feature in the opening, as to move the trigger arm **36**, this not only has to be moved in the transverse direction T but also distally in the axial direction A.

[0187] Once the needle guard **18** is moved towards the drive chassis **24** on moving the autoinjector **10** from the storage state into the dispensing state, the plunger arm **142** via the engagement surface deflects the trigger arm **36**, i.e. via the deflection surface **150** of the web **148**, both distally in the axial direction A by lifting the web **148** distally in the axial direction A and pushing the web **148** transversely in the transverse direction T.

[0188] Once the projection **154** of the trigger arm **36** has passed the apex **160**, the spring force of the drive spring **74** causes the drive spring **74** to relax and urge the drive chassis **24** proximally in the axial direction A and the trigger arm **36** out of engagement from the opening **138** as indicated e.g. in FIG. **8**C or shown in FIG. **4**C.

[0189] Moreover, once the engagement surface **146** of the plunger arm has deflected the trigger arm **36** in the trans-

verse direction T this can also be deflected radially inwardly in the radial direction R. As is shown in FIG. **4**B, this is because the transverse deflection of the trigger arm **36** by the engagement surface **146**, moves the trigger arm **36** out of possible engagement from the blocking rib **144** of the plunger arm **142**, so that the trigger arm can then also deflect radially inwardly in the radial direction R past the blocking rib **144**.

[0190] Prior to dispense, the trigger arm **36** of the drive chassis **24** is biased into engagement with the axial stop feature **54** in the outer body **82** of the housing **12**.

[0191] Under the action of the axial force from the drive spring **74** on the drive chassis **24**, the trigger arm **36** is discouraged from moving either transversely or radially inwards by.

[0192] the negative inclined contact surface **156** of the outer body **82** of the housing **12**,

[0193] friction acting against them,

[0194] the angle of the trigger arm **36**, and

[0195] the stiffness of the trigger arm **36**.

[0196] In this connection it should be noted that this geometry can require the drive chassis **24** to be slightly lifted and therefore the drive spring **74** to be slightly compressed in order to disengage the trigger arm **36**. However, sufficient robustness (i.e. protection against accidental triggering) can be achieved purely by a combination of the load and frictional coefficient of the surfaces of the stop feature **54** and of the trigger arm **36** in contact. If the frictional coefficient is high enough, even a negatively inclined holding surface (opposite to that shown in the diagram) can be functional.

[0197] The blocking rib **144** on the needle guard **18** also prevent the trigger arm **36** from moving radially inwards. It would also be feasible to add further blocking rib features (not shown) to the needle guard to prevent transverse movement of the trigger arm **36**. These transverse blocking rib features would be arranged such that, during the initial displacement of the needle guard **18** on actuation, they axially disengage from and release transverse movement of the trigger arm **36**.

[0198] FIG. **8**A illustrates the storage position of the release mechanism **40** in the storage state. The dispensing process is triggered by pressing the needle guard **18** against the users skin so that it is displaced distally relative to the outer body **82** of the housing **12**.

[0199] The angled engagement surface **146** of the cam **162** of the needle guard **18** contacts the trigger arm **36** and translates its projection **154** transversely over the apex **160** of the stop feature **54** in the outer body **82** of the housing **12**.

[0200] Once the projection **154** of the trigger arm **36** is over the apex **160** of the stop feature **54**, it engages with a steeper slope of the second planar surface **158** that, under the action of the drive spring **74**, causes the trigger arm **36** to continue to deflect and eventually disengage the stop feature **54** also in the radial direction without further contact from the needle guard **18**.

[0201] FIG. **8**B illustrates the release mechanism **40** at the point of triggering, in one optional embodiment, after a short transverse movement, the trigger arm **36** contacts the outer body **82** with a further angled face that forces it to move radially inwards until they disengage entirely from the stop feature **54**.

[0202] In an alternative embodiment, the cross-section profile of the trigger arm **36** tends to create a radial movement of the projection **154** (to enable disengagement) when the arm **36** is moved transversely.

[0203] Once fully disengaged, the drive chassis **24** advances towards the pre-filled syringe **16** to engage the plunger **26** and starts to dispense medicament M under the action of the drive spring **74**.

[0204] FIG. **8**C illustrates the released position of the release mechanism **40**. The overhauling convex surface **152** of the stop feature **54** of the outer body **82** of the housing **12** and the radial lead-in of the trigger arm **36** increases the axial load bearing contact area (which in turn minimises stress for a given drive spring **74** force) while simultaneously requiring only a short travel to trigger. This short travel to trigger tends to reduce the triggering force input required of the user, with the drive spring **74** actually contributing a large part of the triggering energy.

[0205] FIG. **10**A illustrates a view of the position of the needle guard **18** of the autoinjector **10** relative to the inner body **80** of the housing **12** in the storage state of the autoinjector **10**. FIG. **10**B illustrates a view of the position of the needle guard **18** of the autoinjector **10** relative to the housing **12** in the lock-out state.

[0206] The drive chassis **24** is likewise inserted into the inner body **80**. The inner body **80** comprises the lug **164** cooperating with the second groove **48'** of the drive chassis **24** as the second guiding aid **48** that enables a linear guidance of the drive chassis **24** within the inner body **80** of the housing **12**.

[0207] The needle guard **18** comprises a protrusion **166** cooperating with an elongate hole **168** present in the inner body **80**, to ensure a linear guidance of the needle guard **18** relative to the inner body **80**.

[0208] The needle guard **18** further comprises an anti-pull off feature **170**. The anti-pull off feature **170** being configured to prevent a removal of the needle guard from the proximal end of the housing **12**.

[0209] For this purpose, the elongate hole **168** comprises a proximal stop **172** that prevents the protrusion **166** from being moved proximally beyond the stop **172** and hence the stop **172** acts as the anti-pull off feature **170** of the needle guard **18**.

[0210] In this connection it should be noted that the elongate hole **168** is dimensioned such that it is complementary to the shape of the protrusion **166** and such that it defines a linear movement range of the needle guard **16** relative to the inner body **80**.

[0211] This means that a width of the elongate hole **168** perpendicular to the axial direction A can be selected such that it is complementary to a width of the protrusion perpendicular to the axial direction A.

[0212] Moreover, a length of the elongate hole **168** between the proximal stop **172** and a distal stop **192** in parallel with the axial direction A can be selected to correspond to a movement range along the axial direction of the needle guard **18**.

[0213] The inner body **80** further comprises a first cut-out **174**. The first cut-out **174** being configured to cooperate with a clip arm **184** and a lock-out arm **186** of the needle guard **18**.

[0214] Specifically, as shown in FIG. **10**A, the clip arm **184** cooperates with a first portion **180** of the first-cut-out **174** and the lock-out arm **186** is configured to cooperate with a second portion **182** of the first cut-out **174**.

[0215] The first and second portions **180** and **182** of the first cut-out respectively have a rectangular shape, directly adjoin one another and are offset along the axial direction A with respect to one another.

[0216] The inner body **80** further comprises a second cut-out **176** that is axially arranged adjacent to the first cut-out **174** and is separated from the first cut-out **174** by a bar **178**. The second-cut-out **176** is configured to cooperate with the lock out arm **186**.

[0217] In this connection it should be noted that the second cut-out is configured to only cooperate with the lock-out arm **186** and thus not with the clip arm **184**. This is made possible due to the offset between the first and second portions **180**, **182**.

[0218] In this connection it should further be noted that the lock-out arm comprises an engagement portion **220** that is configured to engage a corresponding cut-out **176**.

[0219] In the embodiment shown the engagement portion **220** has a ramp **222** via which it can overcome the bar **178** on being moved proximally from the first cut-out **174** to the second cut-out **176** and a planar portion **224** that is configured to drop into the second cut-out **176** and then to act as an abutment that prevents a distal movement of the needle guard **18** out of the lock-out state beyond the bar **178**.

[0220] As indicated the first cut-out **174** can be present at the same side of the inner body **80** as the elongate hole **168**. The first cut-out **174** can also be present at a side different from the side at which the elongate hole **168** is arranged. It is further possible that two first cut-outs **174** and/or two elongate holes **168** are provided that are then arranged at oppositely disposed sides of the inner body **80** (see e.g. FIGS. **14**A to **14**J).

[0221] As also indicated in FIGS. **10**A and **10**B, the nose **188** of the connection **72** is present at the inner body **80**. The nose **188** cooperates with the window **190** shown e.g. in FIGS. **4**A-**4**C to form the connection **72**.

[0222] The function of the needle guard **18** before dispense is as follows:

[0223] The needle guard spring, i.e. the lock-out spring **76** (that is biased against the inner body **80**) applies a proximal force to the needle guard **18**. The needle guard **18** is axially retained within the inner body **80** by its clip arm **184**. The needle guard lock-out arm **186** is in clearance to the inner body to avoid long term creep affecting subsequent lock-out robustness.

[0224] As the needle guard **18** is pressed during dispense by the user, the clip arm **184** moves up within the first cut-out **174**, more specifically within the first portion **180** of the first cut-out **174**, in the inner body **80**. Towards the end of the dispense stroke of the drive chassis **24** (but before an end of dose click (see FIGS. **11**A-**11**B), to avoid the associated losses occurring at the same time and reducing the minimum output force from the drive chassis **24**), the drive chassis **24** contacts a chamfer **226** of the clip arm **184** of the needle guard **18** thereby, deflecting and holding the clip arms **184** radially inwards. The chamfer **226** aids in the deflection of the clip arm **184** in the radial direction R.

[0225] Once a user removes the needle **34** and thereby the needle guard **18** from the skin, the needle guard **18** extends linearly proximally under the action of the lock-out spring **76**. Because the clip arm **184** is deflected radially inwards by the drive chassis **24**, it does not engage with an inner body assembly stop feature **194** during this return travel. Instead, the needle guard **18** continues to extend until its lock-out arm **184** engages with the bar **178** of the inner body **80** in an extended position to lock the needle guard **18** from being able to move in the distal direction. The bar **178** separates the first cut-out **174** from the second cut-out and the lock-out arm **184** is moveable within the first-cut out **174** during use and prior to lock-out of the needle guard **18**.

[0226] Moreover, the protrusion **166** prevents the needle guard **18** from being moved more proximally, in the lock-out state as it engages the proximal end of the elongate hole **168** acting as the anti-pull off feature **170**.

[0227] FIG. **10**B illustrates the extended position of the needle guard **18** following dispense and the lock-out clip **186** engages the bar **178**. In the fully extended position, the lock-out arm **186** of the needle guard **18** engages with the bar **178** of the inner body **80** to provide a mechanical lockout against depression of the needle guard **18**, thus protecting the user from the risk of needle stick.

[0228] FIG. **11**A illustrates a view of the autoinjector **10** in the dispensing state at end of dose, and b) an enlarged view of part of the autoinjector **10** in the dispensing state at the end of dose.

[0229] The trigger limb **32** further comprises at least a first part **56** of an audible end of dose feedback member **58** in the shape of a click arm **56**. The first part **56**, i.e. the click arm **56**, is formed by a nose **60**, optionally having a generally triangular outer shape, formed at an end of a tongue **62**, projecting from the trigger limb **32**.

[0230] The tongue **62** projects from the trigger limb **32** in the region of a recess **64** formed in the outer surface **49** of the trigger limb **32**. An opening **68** of the recess **64** faces in the radial direction R.

[0231] The inner body **80** of the housing **12** further comprises at least a second part **66** of the audible end of dose feedback member **58** (see e.g. FIG. **11**B).

[0232] The second part **66** of the audible end of dose feedback member **58** comprises a distal surface **196** and a proximal surface **198** surrounding an inner body recess **206**.

[0233] In this connection it should be noted that the positioning of the respective first and second parts **56**, **66** of the audible feedback member **58** could be reversed, i.e. the recess **206** could be provided at the drive chassis **24**, whereas the tongue **62** could be provided at the inner body **80**. It should also be noted that each one of the drive chassis **24** and the inner body **80** could comprise a respective first and second part **56**, **66** of the audible feedback member **58** which cooperate with a respective other one of the first and second part **56**, **66** of the audible feedback member **58** provided at the other component, i.e. the inner body **80** has both a recess and a tongue each cooperating with a respective one of a tongue and a recess at the drive chassis **24**.

[0234] On use of the autoinjector **10**, the trigger limb **32** is moved by the drive spring **74** in the axial direction A during dispensing, the first part **56** of the audible end of dose feedback member **58** is then deflected in the transverse direction T towards the drive spring **74**.

[0235] This is achieved as an inclined surface **200** of the end of dose feedback member **58** is deflected by a distal inner housing end **204** of the inner housing **80**. This can be aided as the distal inner housing end **204** can be chamfered towards the distal wall **84** of the housing **12**.

[0236] The audible end of dose feedback member **58** is configured to emit a sound once the material has been dispensed from the autoinjector, i.e. once a click surface **202** of the nose **60** attached to the latching tongue **62** engages the

distal surface **196** of the inner body recess **206** by moving in the transverse direction T outwardly

[0237] The positions of the first and second parts **56**, **66** of the audible feedback member **58** are selected such that the audible click occurs once the plunger **26** reaches or is about to reach its final position in the pre-filled syringe **16**.

[0238] Thereby the audible end of dose feedback member **58** is configured to emit a sound between the drive chassis **24** and the housing **12** once the material has been dispensed from the autoinjector **10**.

[0239] Thus, towards the end of dose, the nose **60** of the drive chassis **24** engages with a ramp of the inner body **80**, i.e. the chamfered distal inner housing end **204** which deflects the tongue **62** radially inwards. Near the end of travel, nose **60** drops through the inner housing recess **206** in the inner body **80**, rapidly releasing its deformation and creating an audible click (either by virtue of contact with another component surface or purely acceleration in the air).

[0240] FIGS. **12**A to **12**F illustrate various views of an example of the cap **70** of the autoinjector **10**.

[0241] FIG. **12**A illustrates a perspective view of the removable cap **70**. The cap **70** is of single piece design. The needle guard **18** is configured to cooperate with the cap **70** via one or more snap-fit connections **94**.

[0242] FIGS. **12**B and **12**C illustrate respective side views of the cap indicating sectional lines C:C, D:D and E:E of the respective sections shown in FIGS. **12**D to **12**F.

[0243] The windows **112** shown in FIG. **12**B have an at least generally rectangular shape with rounded edges.

[0244] The recesses **114** shown in the FIG. **12**C have the shape of a slot with a rounded end and separate the windows **112**.

[0245] In this connection it should further be noted that the provision of the windows **112** at the needle shield holder **104** also provide a respective tooling lead-in surface that enables ejection of the cap **70** from the injection mold tool.

[0246] FIG. **12**D illustrates a section through the cap **70** taken along the sectional line C:C of FIG. **12**B. The ribs **120** are provided at the inner surface **118** of the cap **70** only in a region where the needle shield holder **104** is not present within the cap **70**.

[0247] As indicated in the section shown in FIG. **12**E taken along the sectional line D:D of FIG. **12**B. The space provided within the needle shield holder **104** for receiving and holding the removable needle shield **78** covering the needle of the pre-filled syringe **16** in the storage state of the autoinjector **10** is visible.

[0248] An inner shape of the needle shield holder **104** is shaped complementary to an outer shape of the removable needle shield **78** to aid an as compact a design as possible of the cap **70** and to permit a reliable removal of the removable needle shield **78** on removing the cap **70** from the autoinjector **10**.

[0249] Moreover, the opening **124** of the cap **70** is formed between the outer wall **116** of the cap **70** and the needle shield holder **104**. The dimensions of the opening are selected in dependence on the dimensions of the part of the needle guard that is to be inserted into the opening in the storage state to the autoinjector **10**.

[0250] The needle shield holder **104** projects distally from the base **100** of the cap **70** and is surrounded by the outer wall **116** of the cap **70**. The inner surface **118** of the outer wall **116** of the cap **70** comprises several ribs **120**. These ribs are configured to press against the front end **122** of the needle guard **18** when this is arranged within the opening **124**.

[0251] As indicated in the section shown in FIG. **12**F taken along the sectional line E:E of FIG. **12**C, the ribs **120** project inwardly into the opening **124** of the cap **70**. The ribs **120** are distributed over the inner surface **118** in order to hold the front end **122** of the needle guard **18**.

[0252] The inner wall **106** of the needle shield holder **104** further comprises the two windows **112**, with a respective one of the inwardly facing projections **108** being arranged at each of the windows **112**.

[0253] Two recesses **114** are formed in the inner wall **106** of the needle shield holder **104** of the cap **70**. The recesses are arranged between respective parts of the needle shield holder **104** having the windows **112**.

[0254] The snap-fit areas **98** of the cap **70** are provided at the inner surface **118** of the cap **70** and a first snap-fit area **208** is formed within some of the ribs **120** of the cap, whereas a second snap in area **210** is formed in a region of the cap **70** free of ribs **120**.

[0255] The cap **70** is of single piece design and an end face in a proximal surface of the cap **70** at the base **100** does not comprise a hole.

[0256] FIGS. **13**A to **13**J illustrate various views of an example of the outer body **82** of the autoinjector **10**. FIGS. **13**A and **13**B illustrate respective perspective views from two sides of the outer body **82**, whereas FIGS. **13**C to **13**F illustrate respective side views of the outer body **82**, FIG. **13**G illustrates a section taken along the sectional line C:C of FIG. **13**F, FIG. **13**H illustrates a section taken along the sectional line D:D of FIG. **13**E, and FIG. **13**I illustrates a top view of the outer body **82**.

[0257] FIG. **13**J illustrates a section taken along the sectional line E:E of FIG. **13**E. The lug **228** configured to engage the second groove **48'** forming the second guiding aid **48** is visible at the inner surface **132** of the outer body **82**.

[0258] In contrast to the embodiment shown in connection with the previous figures, the outer body **82** comprises two stop features **54** present at either side of the outer body **82** in the respective windows **40** as indicated in FIGS. **13**A, **13**C and **13**E.

[0259] Moreover, the projection **86** projecting from the distal wall **84** of the outer body **82** of the housing **12** is visible in FIG. **13**G. It is arranged at the same transverse position as the trigger limb **32** of the drive chassis **24**, as it is intended to be inserted into the passage **140** of the drive chassis **24** on assembly of the autoinjector **10**.

[0260] In this connection it should be noted that the drive chassis **24** is a component that can be configured to move in a straight line within the housing **12** in order to drive the medicament M stored in the pre-filled syringe **16** arranged within the housing **12** out of the pre-filled syringe **16** on activation of the autoinjector **10** by entraining the plunger **26** of the pre-filled syringe **26**.

[0261] FIG. **14**A to **14**J illustrate various views of an example of the inner body **80** of the autoinjector **10**. FIGS. **14**A and **14**B respective perspective views from two sides of the inner body **80**. The distal housing end **204** having the recess formed thereat are shown at the top of FIGS. **14**A and **14**B.

[0262] FIG. **14**C to **14**F illustrates respective side views of the inner body **80**, FIG. **14**G illustrates a section taken along

the sectional line F:F of FIG. **14**E, FIG. **14**H illustrates a section taken along the sectional line E:E of FIG. **14**F, FIG. **14**I illustrates a top view of the inner body **80** and FIG. **14**J illustrates a section taken along the sectional line G:G of FIG. **14**E.

[0263] The inner body **80** is configured to cooperate with the outer body **82** of FIGS. **13**A-**13**J and with the needle guard **18** shown in the following in FIGS. **15**A-**15**J. The inner body **80** has two first cut-outs **174**, two second cut-outs **176** and two elongate holes **168** arranged at oppositely disposed sides of the inner body **80** and configured to engage corresponding parts of the needle guard **18**.

[0264] FIGS. **15**A to **15**J illustrate various views of an example of the needle guard **18** of the autoinjector **10**, it is configured to cooperate with the inner body **80** of FIGS. **14**A-**14**J, for this purpose it is provided with two protrusions **166** cooperating with a respective one of the elongate holes **168**, two lock-out arms **186** cooperating with a respective one of the first and second cut-outs **174**, **176** separated by a respective bar **178**, and two respective clip-arms **184** engaging the respective first cut-outs **174** and the trigger limb **32** of the drive chassis **24**.

[0265] Moreover, the needle guard **18** also comprises a single plunger arm **142** having two blocking ribs **144** and two cams shaped in the manner described in the foregoing. The blocking ribs **144** are configured to cooperate with the drive chassis **24** discussed in connection with FIGS. **17**A-**17**L when inserted into the housing **12** comprising the outer body **82** discussed in connection with FIG. **13** and the inner body **80** discussed in connection with FIGS. **14**A-**14**J. It should also be noted that the blocking ribs **144** are arranged at opposite sides of the plunger arm **142**.

[0266] FIGS. **15**A and **15**B illustrate respective perspective views from two sides of needle guard **18**, whereas FIGS. **15**C to **15**F illustrate respective side views of the needle guard **18**, FIG. **15**G illustrates a section taken along the sectional line D:D of FIG. **15**E, FIG. **15**H illustrates a section taken along the sectional line E:E of FIG. **15**F, FIG. **15**I illustrates a top view of the needle guard **18** **80** and FIG. **15**J illustrates a section taken along the sectional line F:F of FIG. **15**E.

[0267] FIGS. **16**A to **16**K illustrate various views of an example of the needle shield **78** of the autoinjector **10**. The needle shield **78** has a needle receptacle **212** at an end thereof comprising the syringe facing surface **110**. The syringe facing surface **110** is arranged opposite to a front end **214** of the needle shield **78**. The needle shield **78** has outer dimensions configured to be received in the needle shield holder **104** and inner dimensions adapted to receive the needle **34** of the pre-filled syringe **16**.

[0268] FIGS. **16**A, **16**B, **16**D, **16**E illustrate various perspective views from above and below of the needle shield **78**, FIG. **16**C, **16**F, **16**G, **16**H respective side views of the needle shield **78**, FIG. **161** illustrates a section taken along the sectional line B:B of FIG. **16**G, FIG. **16**J illustrates a view from the front end **214** and FIG. **16**K illustrates a section taken along the sectional line C:C of FIG. **16**G.

[0269] The section B:B of FIG. **161** indicates that the needle receptacle **212** is shaped complementary to the needle **34** of the pre-filled syringe **16**. The function of the needle shield **78** is to protect the needle **34** from external influences.

[0270] FIGS. **17**A to **17**L illustrate various views of an example of the drive chassis **24** of the autoinjector **10**. The drive chassis **24** has two trigger arms **36** each with its respective components as discussed in the foregoing, a single audible feedback member **58** arranged at a side of the drive chassis **24**.

[0271] FIGS. **17**A and **17**B illustrate perspective views of the drive chassis **24**, whereas FIGS. **17**C to **17**F illustrate different side views of the drive chassis **24**. FIG. **7**G illustrates a section taken along the section line E:E of FIG. **17**E illustrates through the dispensing limb **22** having the plunger support **44**.

[0272] FIG. **17**H illustrates a section taken along the sectional line F:F of FIG. **17**E through the trigger limb **32** indicating the passage **140** formed therein.

[0273] FIG. **17**I illustrates a section taken along the sectional line G:G of FIG. **17**F showing the parallel arrangement of the dispensing limb **22** and the trigger limb **32**.

[0274] FIG. **17**J illustrates a top view of the drive chassis **24** with the projections **154** of the trigger arms **36** projecting radially outwardly from the drive chassis **24**.

[0275] FIG. **17**K illustrates a section taken along the sectional line D:D of FIGS. **17**E and **17**L illustrate a section taken along the sectional line C:C of FIG. **17**E at a height of the drive chassis **24** where the two projections **154** are positioned relative to the trigger arms **36**.

[0276] FIGS. **17**D and **17**F by way of example show that the trigger limb **32** comprises a lip **216** at an end disposed opposite to the web **42**. The lip **216** is configured to engage the clip arms **184** formed at the needle guard **18**.

[0277] The lip **216** comprises two tips **218**, with each tip **218** being configured to engage a respective one of the clip arms **184** formed at the needle guard **18**.

[0278] It should also be noted that the first and second guiding aids extend proximally from the web **42**, with the second groove **48'** extending directly from the web **42** and the first groove **46'** begin offset from the web **42**.

[0279] In the foregoing the mechanism elements of a disposable auto-injector **10** to dispense medicament M from the pre-filled syringe (PFS) **16** are described. The design disclosed permits state of the art features to be incorporated into a small physical package using a very small number of low cost components and a very simple process, compared to the state of the art.

[0280] The auto-injector device disclosed consists of an assembly surrounding a pre-filled syringe (PFS) **16** that contains medicament M. Typically, such devices are single-use and intended for administration by a patient (i.e. self-administration) or carer.

[0281] At point of use, the user removes the protective Cap **70** from the proximal end of the autoinjector **10**, positions the autoinjector **10** at the injection site (typically the skin of the thigh or belly) and presses the autoinjector **10** axially in a proximal direction, to achieve needle insertion of the needle **34** into the skin and to initiate dispense.

[0282] Energy from a helical compression drive spring **74** is released to displace the plunger **26** within the PFS **16** and deliver the medicament M to the patient. An audible click notifies the patient that dispense has started. In this connection it should be noted that such an audible click can be generated when the trigger arm **36** cooperates with the stop feature **54** on triggering the release mechanism **40** on moving the autoinjector **10** from the storage state to the dispensing state. The progress of dispense can be monitored

by the user as a change in position of the PFS plunger **26** and mechanism plunger within the large wrap-around 'syringe window' **14**.

[0283] The user is notified when the dose is complete by an audible click emitted from the autoinjector **10** and a change in the colour displayed within a unique 'status indicator window' **20**. The autoinjector **10** can then be removed from the injection site, allowing the sprung needle guard **18** to extend to a locked position under the action of a separate helical compression spring **76** to cover the needle **34**. In this locked position, the needle guard **18** covers the needle **34** and protects the patient or a further person from needle **34** stick injuries.

[0284] The mechanism described utilises a parallel drive arrangement where the axis of the drive spring **74** is offset from the axis of the PFS **16**, rather than passing into the bore of the PFS **16** as is common in the prior art. This arrangement has a number of advantages:

[0285] The length of the autoinjector **10** can be minimised so that it is largely determined by the PFS **16** length and plunger **26** travel.

[0286] It allows flexibility in the specification of the drive spring **74** (e.g. to increase or reduce the force it applies or make other modifications to improve the efficiency of manufacturing), since its geometry is not constrained by the PFS **16** bore diameter.

[0287] It allows improved access to components and features, where a tubular arrangement often necessitates a number of concentric (or at least co-axial) components that move relative to each other, which can then be challenging to connect with each other in the optimal way. The improved access further allows simpler interactions between components to create features for triggering, feedback and lock-out which tend to avoid the need for additional parts or complex mechanisms.

[0288] The simplicity of the mechanism results in a reduced number of components, which in turn helps to minimise the number of wall thicknesses required and hence device width and depth.

[0289] Due to the disposable nature of single-use autoinjectors **10**, it is considered advantageous to minimise autoinjector **10** complexity, material usage, package size and assembly complexity in this way, as this all tends to reduce cost and environmental impact by:

[0290] Reducing the volume of raw materials used,

[0291] Reducing the cost of manufacturing equipment and the assembly process,

[0292] Reducing the volume required in transport and storage, which can be particularly expensive when low temperatures are required.

[0293] The disclosed disclosure achieves this simplicity and small size whilst incorporating state of the art user features and adding innovative new user features.

Enumerated Embodiments

[0294] 1. An autoinjector **10** comprising:

[0295] a housing **12**,

[0296] a pre-filled syringe **16** mounted in the housing **12** and fixed relative to the housing **12**, and

[0297] a needle guard **18** mounted axially moveable in the housing **12** for movement between a storage state, a dispensing state and a lock-out state in which states the needle guard **18** adopts different axial positions relative to the housing **12**,

[0298] wherein the needle guard **18** is configured to be axially moved in a distal direction between the storage state and the dispensing state and

[0299] wherein the needle guard **18** is configured to be axially moved in a proximal direction between the dispensing state and the lock-out state.

[0300] 2. The autoinjector **10** according to embodiment 1, wherein the needle guard **18** surrounds a needle **34** of the pre-filled syringe **16** in the storage state and in the lock-out state.

[0301] 3. The autoinjector **10** according to embodiment 1 or embodiment 2, wherein the needle guard **18** does not surround a needle **34** of the pre-filled syringe **16** in the dispensing state.

[0302] 4. The autoinjector **10** according to one of embodiments 1 to 3, further comprising a lock-out spring **76** arranged between the needle guard **18** and the housing **12**.

[0303] 5. The autoinjector **10** according to embodiment 4, wherein the needle guard **18** is configured to compress the lock-out spring **76** on moving between the storage state and the dispensing state.

[0304] 6. The autoinjector **10** according to embodiment 4 or embodiment 5, wherein the needle guard **18** is configured to be moved by a relaxation of the lock-out spring **76** between the dispensing state and the lock-out state.

[0305] 7. The autoinjector **10** according to one of embodiments 1 to 6, wherein the needle guard **18** comprises one or more lock-out arms **186**.

[0306] 8. The autoinjector **10** according to embodiment 7, wherein the one or more lock-out arms **186** comprise an engagement portion **220** that is configured to engage a corresponding cut-out **176** in the housing **12** of the autoinjector **10** in the lock-out state.

[0307] 9. The autoinjector **10** according to one of embodiments 4 to 8 and embodiment 7, wherein two or more lock-out arms **186** are provided, with the lock-out spring **76** being arranged between the two or more lock-out arms **186**.

[0308] 10. The autoinjector **10** according to one of embodiments 1 to 9, wherein the needle guard **18** comprises an anti-pull off feature **170** cooperating with the housing **12**.

[0309] 11. The autoinjector **10** according to one of embodiments 1 to 10, wherein the needle guard **18** comprises a plunger arm **142** for activation of a release mechanism **40** of the autoinjector **10**.

[0310] 12. The autoinjector **10** according to embodiment 10 and embodiment 11, wherein the anti-pull off feature **170** is arranged at the plunger arm **142**.

[0311] 13. The autoinjector **10** according to one of embodiments 10 to 12, wherein the anti-pull of feature **170** comprises a protrusion **166** that engages a hole **168** present in the housing **12**.

[0312] 14. The autoinjector **10** according to one of embodiments 1 to 13, further comprising a drive chassis **24**, the drive chassis **24** being mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12**, the drive chassis **24** further

being fixed with respect to the housing **12** and a movement relative to the housing **12** in a storage state of the autoinjector **10**.

[0313] 15. The autoinjector **10** according to embodiment 14 and of embodiments 7 to 13, wherein the drive chassis **24** is configured to engage the one or more clip arms **184** to deflect these radially inwardly away from the housing **12** in the dispensing state.

[0314] 16. The autoinjector **10** according to embodiment 14 or embodiment 15 and one of embodiments 11 to 13, wherein the plunger arm **142** is configured to cooperate with a trigger arm **36** of the drive chassis **24** for activation of a release mechanism **40** of the autoinjector **10**.

[0315] 17. The autoinjector **10** according to one of embodiments 14 to 16, wherein an axial movement of the needle guard **18** towards the drive chassis **24** releases the fixing of the drive chassis **24** with respect to the housing **12** on activation of the autoinjector **10**.

[0316] 18. The autoinjector **10** according to embodiment 16 or embodiment 17, wherein the axial movement of the needle guard **18** is configured to deflect the trigger arm **36** in a direction transverse to the axial movement.

[0317] 19. The autoinjector **10** according to one of embodiments 16 to 18 and one of embodiments 11 to 15, wherein the plunger arm **142** is configured to deflect the trigger arm **36** in a direction transverse to the axial movement of the needle guard **18**.

[0318] 20. The autoinjector **10** according to one of embodiments 1 to 19, wherein the needle guard **18** comprises a blocking rib **144**.

[0319] 21. The autoinjector **10** according to embodiment 20 and one of embodiments 16 to 19, wherein the blocking rib **144** is configured to block a radial movement of the trigger arm **36**.

[0320] 22. The autoinjector **10** according to one of embodiments 1 to 21, wherein the needle guard **18** further comprises cam **162** having an engagement surface **146**.

[0321] 23. The autoinjector **10** according to one of embodiments 16 to 21 and embodiment 22, wherein the engagement surface **146** is configured to engage the trigger arm **36**.

[0322] 24. The autoinjector **10** according to embodiment 23, wherein the trigger arm **36** comprises a web **148** and the engagement surface **146** engages the web **148** of the trigger arm **36**.

[0323] 25. The autoinjector **10** according to one of embodiments 21 to 24 and embodiment 20, wherein the engagement surface **146** projects from the blocking rib **144**.

[0324] 26. The autoinjector **10** according to embodiment 24 or embodiment 25, wherein the web **148** comprises a deflection surface **150** inclined with respect to a movement direction of the drive chassis **24**.

[0325] 27. The autoinjector **10** according to one of embodiments 22 to 26, wherein the engagement surface **146** is inclined with respect to a movement direction of the drive chassis **24**.

[0326] 28. The autoinjector **10** according to embodiment 26 and embodiment 27, wherein the engagement surface **146** and the deflection surface **150** are inclined with respect to a movement direction of the drive chassis **24** in a cooperating manner.

[0327] 29. The autoinjector **10** according to embodiment 28, wherein the engagement surface **146** is inclined to deflect the trigger arm **36** in the direction transverse to the axial direction of movement of the needle guard **18**.

[0328] 30. The autoinjector **10** according to one of embodiments 14 to 29, further comprising a drive spring **74**, with the drive spring **74** being configured to drive the drive chassis **24** towards the needle guard **18** after activation of the autoinjector **10**.

[0329] 31. The autoinjector **10** according to one of embodiments 1 to 30, wherein the needle guard **18** is configured to cooperate with a cap **70** via one or more snap-fit connections **94**.

[0330] 32. The autoinjector **10** according to embodiment 31, wherein each snap fit connection comprises a snap-fit projection **96** cooperating with a corresponding snap-fit area **98**.

[0331] 33. The autoinjector **10** according to embodiment 32, wherein the needle guard **18** comprises one or more snap-fit projections **96**.

[0332] 34. The autoinjector **10** according to embodiment 32 or embodiment 33, wherein one or more snap-fit projections **96** are provided at an outer surface **126** of the needle guard **18**.

[0333] 35. The autoinjector **10** according to one of embodiments 32 to 34, wherein an inner surface **128**, **132** of the housing **12** comprises one or more grooves **130**, **134** in which one or more of the snap-fit projections **96** can axially move relative to the housing **12** on a axial movement of the needle guard **18**.

[0334] 36. The autoinjector **10** according to one of embodiments 31 to 35, wherein a front end **122** of the needle guard **18** is arranged within an opening **124** of the cap **70**.

[0335] 37. The autoinjector **10** according to one of embodiments 31 to 36, wherein an outer wall **116** of the cap **70** contacts an outer wall **136** of the housing **12** in the storage state of the autoinjector **10**.

[0336] 38. The autoinjector **10** according to embodiment 37, wherein the outer wall **116** of the cap **70** and the outer **136** wall of the housing **12** do not overlap in an axial direction of the autoinjector **10**.

[0337] 39. The autoinjector **10** according to embodiment 37 or embodiment 38, wherein the outer wall **116** of the cap **70** and the outer wall **136** of the housing **12** radially overlap in the storage state of the autoinjector **10**.

[0338] 40. The autoinjector **10** according to one of embodiments 1 to 39, wherein the housing **12** is a two-part housing **12** comprising an inner body **80** and an outer body **82**.

[0339] 41. The autoinjector **10** according to one of embodiments 1 to 40, further comprising a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12**, the drive chassis **24** further being fixed with respect to the housing **12** and for a movement relative to the housing **12** in a storage state of the autoinjector **10**, the drive chassis **24** moving relative to the housing **12** on dispensing a material from the pre-filled syringe **16**.

[0340] 42. The autoinjector **10** according to embodiment 41, wherein the autoinjector **10** is configured to generate an audible end of dose feedback between the drive chassis **24** and the housing **12** once the material has been dispensed from the autoinjector **10**.

[0341] 43. The autoinjector **10** according to one of embodiments 1 to 42, further comprising a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12** by a drive spring **74**, the drive chassis **24** further being fixed with respect to the housing **12** and a movement relative to the housing **12** in a storage state of the autoinjector **10**.

[0342] 44. The autoinjector **10** according to embodiment 43, wherein the drive chassis **24** comprises a trigger arm **36** engaging a stop feature **54** present in the housing **12** in the storage state of the autoinjector **10** for fixing the drive chassis **24** with respect to the housing **12**.

[0343] 45. The autoinjector **10** according to embodiment 44, wherein the trigger arm **36** is configured to be disengaged from the stop feature **54** on activation of the autoinjector **10**.

[0344] 46. The autoinjector **10** according to one of embodiments 1 to 45, further comprising a needle shield **78** covering a needle **34** of the pre-filled syringe **16** in a storage state of the autoinjector **10**, the axially moveable needle guard **18** arranged to cover the needle **34** of the pre-filled syringe **16** at least after use of the autoinjector **10** and to move relative to the pre-filled syringe **16** during use of the autoinjector **10**, as well as a removable cap **70** in which the needle guard **18** is stored in the storage state of the autoinjector **10**.

[0345] 47. The autoinjector **10** according to embodiment 46, wherein the cap **70** is removably connected to the needle guard **18** in the storage state of the autoinjector **10**, and wherein, on removal of the cap **70**, the needle shield **78** is also removed from the autoinjector **10**.

[0346] 48. The autoinjector **10** according to one of embodiments 1 to 47, further comprising a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12** and being fixed with respect to the housing **12** in a storage state of the autoinjector **10**.

[0347] 49. The autoinjector **10** according to embodiment 48, further comprising a status indicator window **20** arranged at the housing **12** via which the drive chassis **24** is visible from the outside, with the status indicator window **20** showing a first part **50** of the drive chassis **24** in the storage state of the autoinjector **10** and a second part **52** of the drive chassis **24** after use of the autoinjector **10**, with the first and second parts **50**, **52** of the drive chassis **24** being distinguishable from one another.

[0348] 50. The autoinjector **10** according to one of embodiments 1 to 49, further comprising a drive chassis **24**, the drive chassis **24** comprising a dispensing limb **22** and a trigger limb **32**, wherein a plunger **26** is arrangeable at a proximal end of the dispensing limb **22** and a trigger arm **36** is arranged extending proximally from the trigger limb **32**.

[0349] 51. The autoinjector **10** according to embodiment 50, wherein the trigger limb **32** and the dispensing limb **22** are arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal end side of the dispensing limb **22** and the trigger limb **32** via a web **42**.

[0350] 52. An autoinjector **10**, optionally in accordance with one of embodiments 1 to 51, the autoinjector **10** comprising.

[0351] a housing **12**,

[0352] a pre-filled syringe **16** mounted in the housing **12**,

[0353] a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12**, the drive chassis **24** further being fixed with respect to the housing **12** and for a movement relative to the housing **12** in a storage state of the autoinjector **10**, the drive chassis **24** moving relative to the housing **12** on dispensing a material from the pre-filled syringe **16**, and

[0354] wherein the autoinjector **10** comprises an audible feedback member **58** is configured to generate an audible end of dose feedback between the drive chassis **24** and the housing **12** once the material has been dispensed from the autoinjector **10**.

[0355] 53. The autoinjector **10** according to one or more of the preceding embodiments, wherein drive chassis **24** comprises a first part **56** of the audible feedback member **58** that engages a second part **66** of the audible feedback member **58** arranged at the housing **12** to generate the audible end of dose feedback.

[0356] 54. The autoinjector **10** according to one or more of the preceding embodiments, wherein the housing **12** comprises a recess **208** and the drive chassis **24** engages the recess **208** to generate the audible end of dose feedback.

[0357] 55. The autoinjector **10** according to embodiment 53 and embodiment 54, wherein the first part **56** of the audible feedback member **58** of the drive chassis **24** engages the recess **208** to generate the audible end of dose feedback

[0358] 56. The autoinjector **10** according to one or more of the preceding embodiments, wherein the housing **12** comprises a chamfered distal inner housing end **204** on an inner surface **132** thereof.

[0359] 57. The autoinjector **10** according to embodiment 56, wherein the chamfered distal inner housing end **204** deflects a part of the drive chassis **24** radially inwardly as this moves from the storage state to an end of dose state.

[0360] 58. The autoinjector **10** according to embodiment 57 and one of embodiments 53 to 56, wherein the chamfered distal inner housing end **204** deflects the first part **56** of the audible feedback member **58** radially inwardly as the drive chassis **24** moves from the storage state to an end of dose state.

[0361] 59. The autoinjector **10** according to embodiment 58, wherein the chamfered distal inner housing end **204** is configured to deflect the first part **56** of the audible feedback member **58** radially inwardly before the first part **56** of the audible feedback member **58** engages the recess **208**.

[0362] 60. The autoinjector **10** according to one or more of the preceding embodiments, wherein the audible end of dose feedback comprises an audible click.

[0363] 61. The autoinjector **10** according to embodiment 60, wherein the audible click is brought about by at least one of a contact between two components **56**, **66** and an acceleration of a component **56**.

[0364] 62. The autoinjector **10** according to embodiment 60 or embodiment 61 and one of embodiments 57 to 59, wherein the audible click is generated by a radially outwardly directed relaxation of the radially inwardly deflected part **56** of the drive chassis **24**.

[0365] 63. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** further comprises a plunger support **44** for engaging a plunger **26** of the pre-filled syringe **16**.

[0366] 64. The autoinjector **10** according to embodiment 63 and one of embodiments 55 to 62, wherein the first part **56** of the audible feedback member **58** extends from the drive chassis at a part of the drive chassis **24** different from the plunger support **44**.

[0367] 65. The autoinjector **10** according to one or more of the preceding embodiments further comprising a drive spring **74** mounted between the drive chassis **24** and the housing **12**.

[0368] 66. The autoinjector **10** according to embodiment 65 and one of embodiments 63 and 64, wherein a relaxation of the drive spring **74** drives the plunger support **44** towards the plunger **26** of the pre-filled syringe **16** after activation of the autoinjector **10**.

[0369] 67. The autoinjector **10** according to embodiment 66, wherein the drive spring **74** is arranged within a part of the drive chassis **24** comprising the first part **56** of the audible feedback member **58**, in particular in a passage **140**.

[0370] 68. The autoinjector **10** according to one or more of the preceding embodiments, wherein the housing **12** is a two-part housing comprising an inner body **80** and an outer body **82**.

[0371] 69. The autoinjector **10** according to embodiment 68, wherein the inner body **80** and the outer body **82** are fixed in position relative to one another.

[0372] 70. The autoinjector **10** according to embodiment 68 or embodiment 69, wherein the inner body **80** and the outer body **82** are connected to one another via a connection **72**.

[0373] 71. The autoinjector **10** according to embodiment 70, wherein the connection **72** is formed by a nose **188** engaging a window **190**.

[0374] 72. The autoinjector **10** according to embodiment 71, wherein the nose **188** is formed at the inner body **80** and engages the window **190** formed at the outer body **82**.

[0375] 73. The autoinjector **10** according to embodiment 68 and one of embodiments 54 to 72, wherein the inner body **80** comprises the recess **208**.

[0376] 74. The autoinjector **10** according to one or more of the preceding embodiments, wherein the inner body **80** comprises one or more cut-outs **174**, **176** and/or holes **168** that are configured to cooperate with one or more corresponding parts **184**, **186**, **166** of the needle guard **18**.

[0377] 75. The autoinjector **10** according to one or more of the embodiments 68 to 74 and one or more of the embodiments 54 to 66, wherein the drive spring **74** is arranged between the outer body **82** and the drive chassis **24**.

[0378] 76. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** is of generally U-shaped design and comprises a dispensing limb **22** as well as a trigger limb **32**.

[0379] 77. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24**, the first part **56** of the audible feedback member **58** and the plunger support **44** are formed in one piece from the same material.

[0380] 78. An autoinjector **10**, optionally in accordance with one or more of the preceding embodiments, the autoinjector **10** comprising:

[0381] a housing **12** in which a pre-filled syringe **16** is arranged,

[0382] a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12** by a drive spring **74**, the drive chassis **24** further being fixed with respect to the housing **12** and a movement relative to the housing **12** in a storage state of the autoinjector,

[0383] the drive chassis **24** comprising a trigger arm **36** engaging a stop feature **54** present in the housing **12** in the storage state of the autoinjector **10** for fixing the drive chassis **24** with respect to the housing **12**, and

[0384] wherein the trigger arm **36** is configured to be disengaged from the stop feature **54** on activation of the autoinjector **10**.

[0385] 79. The autoinjector **10** according to one or more of the preceding embodiments, wherein the stop feature **54** comprises an opening **138**.

[0386] 80. The autoinjector **10** according to one or more of the preceding embodiments, wherein the stop feature **54** comprises a convex surface **152**.

[0387] 81. The autoinjector **10** according to embodiment 80, wherein the trigger arm **36** is configured to cooperate with the convex surface **152** of the stop feature **54**.

[0388] 82. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** comprises a projection **154** engaging the stop feature **54**.

[0389] 83. The autoinjector **10** according to embodiment 82, wherein the projection **154** is configured to cooperate with the opening **138**.

[0390] 84. The autoinjector **10** according to one of embodiments 82 or embodiment 83, wherein the projection **156** is configured to cooperate with the convex surface **152**.

[0391] 85. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** comprises a web **148** projecting therefrom.

[0392] 86. The autoinjector **10** according to embodiment 85 and embodiment 84 or embodiment 83, wherein the web **148** is arranged at a surface different from a surface at which the projection **154** is arranged.

[0393] 87. The autoinjector **10** according to one or more of the preceding embodiments, further comprising a needle guard **18**, wherein an axial movement of the needle guard **18** towards the drive chassis **24** releases the fixing of the drive chassis **24** with respect to the housing **12**.

[0394] 88. The autoinjector **10** according to embodiment 87, wherein the needle guard **18** comprises a blocking rib **144**.

[0395] 89. The autoinjector **10** according to embodiment 87 or embodiment 88, wherein the needle guard **18** engages the trigger arm **36** on axially moving toward the drive chassis **24**.

[0396] 90. The autoinjector **10** according to one of embodiments 87 to 89 and embodiment 85, wherein the needle guard **18** comprises an engagement surface **146** configured to engage the web **148** of the trigger arm **36**.

[0397] 91. The autoinjector **10** according to embodiment 88 or embodiment 89 and embodiment 90, wherein the engagement surface **146** projects from the rib.

[0398] 92. The autoinjector **10** according to one of embodiments 80 to 86, wherein the web **148** comprises a deflection surface **150** inclined with respect to a movement direction of the drive chassis **24**.

[0399] 93. The autoinjector **10** according to one of embodiments 85 to 87, wherein the engagement surface **146** is inclined with respect to a movement direction of the drive chassis **24**.

[0400] 94. The autoinjector **10** according to embodiment 92 and embodiment 93, wherein the engagement surface **146** and the deflection surface **150** are inclined with respect to a movement direction of the drive chassis **24** in a cooperating manner.

[0401] 95. The autoinjector **10** according to one of embodiments 78 to 94, wherein the drive spring **74** is configured to drive the drive chassis **24** towards the needle guard **18** after activation of the autoinjector **10**.

[0402] 96. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** further comprises a plunger support **44** for engaging a piston of the pre-filled syringe **16**.

[0403] 97. The autoinjector according to embodiment 96, wherein a relaxation of the drive spring **74** drives the plunger support **44** towards the plunger **26** of the pre-filled syringe **16**.

[0404] 98. The autoinjector according to one of the preceding embodiments, wherein the drive chassis **24** is of generally U-shaped design.

[0405] 99. The autoinjector according to one or more of the preceding embodiments, wherein the trigger arm **36**, the drive chassis **24** and the plunger support **44** are formed in one piece from the same material.

[0406] 100. An autoinjector **10**, optionally in accordance with one or more of the preceding embodiments, the autoinjector **10** comprising a pre-filled syringe **16** arranged within a housing **12** of the autoinjector **10**, a needle shield **78** covering a needle **34** of the pre-filled syringe **16** in a storage state of the autoinjector **10**, an axially moveable needle guard **18** arranged to cover the needle **34** of the pre-filled syringe **16** at least after use of the autoinjector **10** and to move relative to the pre-filled syringe **16** during use of the autoinjector **10**, as well as a removable cap **70** in which the needle guard **18** is stored in the storage state of the autoinjector **10**, wherein the cap **70** is removably connected to the needle guard **18** in the storage state of the autoinjector **10**, and wherein, on removal of the cap **70**, the needle shield **78** is also removed from the autoinjector **10**.

[0407] 101. The autoinjector according to one or more of the preceding embodiments, wherein the needle guard **18** is connected to the cap **70** via one or more snap fit connections **94**.

[0408] 102. The autoinjector according to embodiment 101, wherein each snap fit connection **94** comprises a snap-fit projection **96** cooperating with a corresponding snap-fit area **98**.

[0409] 103. The autoinjector according to embodiment 102, wherein one or more snap-fit projections **96** are provided at an outer surface **126** of the needle guard **18**.

[0410] 104. The autoinjector according to embodiment 101 or embodiment 102, wherein one or more snap-fit areas **98** are provided at an inner surface of the cap **70**.

[0411] 105. The autoinjector according to one or more of the preceding embodiments, wherein an outer wall **116** of the cap **70** contacts an outer wall **136** of the housing **12** in a storage state of the autoinjector **10**.

[0412] 106. The autoinjector according to embodiment 105, wherein the outer wall **116** of the cap **70** and the outer wall **136** of the housing **12** do not overlap in an axial direction of the autoinjector **10**.

[0413] 107. The autoinjector according to embodiment 105 or embodiment 106, wherein the outer wall **116** of the cap **70** and the outer wall **136** of the housing **12** radially overlap in the storage state of the autoinjector **10**.

[0414] 108. The autoinjector according to one or more of the preceding embodiments, wherein the cap **70** prevents axial movement of the needle guard **18** when attached to the needle guard **18** in the storage state.

[0415] 109. The autoinjector according to one or more of the preceding embodiments, wherein the needle shield **78** is arranged within an inner wall of the cap **70** in the storage state of the autoinjector **10**.

[0416] 110. The autoinjector according to one or more of the preceding embodiments, wherein a front end of the needle guard **18** is arranged within an opening **124** of the cap **70**.

[0417] 111. The autoinjector according to one or more of the preceding embodiments, wherein a front end **122** of the needle guard **18** is arranged within an opening **124** of the cap **70** and wherein the opening **124** is formed between the outer wall **116** of the cap **70** and the inner wall of the cap **70**.

[0418] 112. The autoinjector according to one or more of the preceding embodiments, wherein a front end **122** of the needle guard **18** is arranged within an opening **124** of the cap **70** and wherein the front end **122** of the needle guard **18** comprises the one or more snap-fit projections **96**.

[0419] 113. The autoinjector according to one or more of the preceding embodiments, wherein an inner surface **128**, **132** of the housing **12** comprises one or more grooves **130**, **134** in which one or more of the snap-fit projections **96** can axially move relative to the housing **12** on a movement of the needle guard **18**.

[0420] 114. The autoinjector according to one or more of the preceding embodiments, wherein the axially moveable needle guard **18** is arranged to move relative to the housing **12** during use of the autoinjector **10**.

[0421] 115. The autoinjector according to one or more of the preceding embodiments, wherein the cap **70** is of single piece design.

[0422] 116. The autoinjector according to one or more of the preceding embodiments, wherein the cap **70** comprises inwardly facing projections **108** at a needle

guard facing end **102** that engage a syringe facing surface **110** of the needle shield **78**.

[0423] 117. The autoinjector according to one or more of the preceding embodiments, wherein the inner wall **106** of the cap **70** comprises two windows **112**.

[0424] 118. The autoinjector **10** according to embodiment 116 and embodiment 117, wherein each projection **108** is arranged at a window **112**.

[0425] 119. The autoinjector **10** according to one or more of the preceding embodiments, wherein recesses **114** are formed in the inner wall of the cap **70**.

[0426] 120. The autoinjector **10** according to one or more of the preceding embodiments, wherein an inner surface **118** of the outer wall **116** of the cap **70** comprises one or more ribs **120**.

[0427] 121. The autoinjector **10** according to one or more of the preceding embodiments, wherein the cap **70** comprises a stand of the autoinjector **10**.

[0428] 123. The autoinjector **10** according to one or more of the preceding embodiments, wherein an axial movement of the needle guard **18** in the direction of the pre-filled syringe **16** brings about an engagement of the release mechanism **40** of a plunger **26** of the pre-filled syringe **16** for dispensing a material stored in the pre-filled syringe **16**.

[0429] 124. An autoinjector **10**, optionally according to one or more of the preceding embodiments, the autoinjector **10** comprising:

[0430] a housing **12** in which a pre-filled syringe **16** is arranged,

[0431] a drive chassis **24** mounted in the housing **12**, the drive chassis **24** being biased with respect to the housing **12** and being fixed with respect to the housing **12** in a storage state of the autoinjector **10**, a status indicator window **20** arranged at the housing **12** via which the drive chassis **24** is visible from the outside, with the status indicator window **20** showing a first part **50** of the drive chassis **24** in the storage state of the autoinjector **10** and a second part **52** of the drive chassis **24** after use of the autoinjector **10**, with the first and second parts **50**, **52** of the drive chassis **24** being distinguishable from one another.

[0432] 125. The autoinjector **10** according to embodiment 124, wherein the status indicator window **20** is formed by an elongate slot extending radially around a part of the housing **12**.

[0433] 126. The autoinjector **10** according to embodiment 124 or embodiment 125, wherein the first and second parts **50**, **52** of the drive chassis **24** are distinguishable from one another due to a difference in colour, a printed label applied at a surface of the drive chassis **24**, a text applied on the surface **49** of the drive chassis **24** and/or an icon displayed in the surface of the drive chassis **24**.

[0434] 127. The autoinjector **10** according to according to one or more of the preceding embodiments, further comprising a syringe window **14** via which the pre-filled syringe **16** is visible from the outside.

[0435] 128. The autoinjector **10** according to embodiment 127, wherein the syringe window **14** shows a content filled in the pre-filled syringe **16** in the storage state of the autoinjector **10**.

[0436] 129. The autoinjector **10** according to embodiment 127 or embodiment 128, wherein the syringe window **14** shows at least one of a plunger **26** arranged within the pre-filled syringe **16** and a part of the dispensing limb **22** in the pre-filled syringe **16** after use of the autoinjector **10**.

[0437] 130. The autoinjector **10** according to one of embodiments 127 to 129, wherein the syringe window **14** is arranged in the housing **12**.

[0438] 131. The autoinjector **10** according to one of embodiments 127 to 130, wherein the syringe window **14** is of elongate shape and a length of the elongate shape extends in an axial direction of the autoinjector **10**.

[0439] 132. The autoinjector **10** according to one of embodiments 127 to 131, wherein the syringe window is arranged transverse to the status indicator window **20**.

[0440] 134. The autoinjector **10** according to one of embodiments 127 to 132, wherein the syringe window shows a different part of the drive chassis **24** in comparison with the status indicator window **20**.

[0441] 135. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** comprises a trigger arm **36** engaging an opening **138** in the housing **12** in the storage state of the autoinjector **10**.

[0442] 136. The autoinjector **10** according to one or more of the preceding embodiments, further comprising a needle guard **18**, wherein an axial movement of the needle guard **18** towards the drive chassis **24** releases the fixing of the drive chassis **24** with respect to the housing **12**.

[0443] 137. The autoinjector **10** according to embodiment 136, wherein the needle guard **18** comprises a plunger arm **142**.

[0444] 138. The autoinjector **10** according to embodiment 136 or embodiment 137, wherein the needle guard **18** engages the trigger arm **36** on axially moving toward the drive chassis **24**.

[0445] 139. The autoinjector **10** according to embodiment 137 or embodiment 138, wherein the plunger arm **142** of the needle guard **18** engages the trigger arm **36** on axially moving toward the drive chassis **24**.

[0446] 140. The autoinjector **10** according to one or more of the preceding embodiments, further comprising a drive spring **74** mounted between an end of the housing **12** and the drive chassis **24**.

[0447] 141. The autoinjector **10** according to embodiment 140, wherein the spring is configured to drive the drive chassis **24** towards the needle guard **18** after activation of the autoinjector **10**.

[0448] 141. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** further comprises a plunger support **44** for engaging a piston of the pre-filled syringe **16**.

[0449] 142. The autoinjector **10** according to embodiment 139 or embodiment 140 and embodiment 141, wherein the relaxation of the drive spring **74** drives the plunger support **44** towards the piston of the pre-filled syringe **16**.

[0450] 143. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** is of generally U-shaped design.

[0451] 144. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trig-

ger arm **36**, the drive chassis **24** and the plunger support **44** are formed in one piece from the same material.

[0452] 145. An autoinjector **10**, optionally according to one or more of the preceding embodiments, comprising a drive chassis **24**, the drive chassis **24** comprising a dispensing limb **22** and a trigger limb **32**, wherein a plunger **26** is arranged at a proximal end of the dispensing limb **22** and a trigger arm **36** is arranged extending proximally from the trigger limb **32**, wherein the trigger limb **32** and the dispensing limb **22** are arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal side of the dispensing limb **22** and the trigger limb **32**.

[0453] 146. An autoinjector **10** according to embodiment 145, wherein the trigger limb **32**, the dispensing limb **22**, the plunger support **44** and the trigger arm **36** are integrally formed in one piece.

[0454] 147. An autoinjector **10** according to embodiment 145 or embodiment 146, wherein the trigger arm **36** is biased with respect to a housing **12** of the autoinjector **10** in a storage state of the autoinjector **10**.

[0455] 148. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** is deflected on moving the autoinjector **10** from a storage state into an activated state of the autoinjector **10**.

[0456] 149. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** is actuated on by a needle guard **18** of the autoinjector **10** on moving the autoinjector **10** from a storage state into an activated state of the autoinjector **10**.

[0457] 150. The autoinjector **10** according to one or more of the preceding embodiments, wherein the plunger support **44** is configured to act on a pre-filled syringe **16** of the autoinjector **10**.

[0458] 151. The autoinjector **10** according to one or more of the preceding embodiments, further comprising a drive spring **74**.

[0459] 152. The autoinjector **10** according to embodiment 151, wherein the drive spring **74** is arranged within a housing **12** of the autoinjector **10** between a distal housing wall **84** and the drive chassis **24**.

[0460] 153. The autoinjector **10** according to embodiment 152, wherein the drive spring **74** biases the trigger arm **36** in a storage state of the autoinjector **10** with respect to the housing **12** of the autoinjector **10**.

[0461] 154. The autoinjector **10** according to one of embodiments 151 to 153, wherein the drive spring **74** is configured to drive the plunger **26** of the autoinjector **10** in a pre-filled syringe **16** of the autoinjector **10**.

[0462] 155. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** is linearly guided within a housing **12** of the autoinjector **10** on moving the autoinjector **10** from a storage state into an activated state of the autoinjector **10**.

[0463] 156. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** is configured to move radially and transversely with respect to the trigger limb **32**.

[0464] 156. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger arm **36** is configured to cooperate with a stop feature **54** arranged at the housing **12** in a storage state of the autoinjector **10**.

[0465] 158. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger limb **32** and the dispensing limb **22** are arranged in an at least generally U-shaped manner respectively in a U-shaped manner.

[0466] 159. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger limb **32** further comprises at least a first part **56** of an audible end of dose feedback member **58**.

[0467] 160. The autoinjector **10** according to embodiment 159, further comprising a housing **12**, wherein the housing **12** further comprises at least one second part **66** of the audible end of dose feedback member **58**, optionally wherein the housing **12** is formed by an outer body **82** and an inner body **80** and one of the inner body **80** and the outer body **82** comprises the at least one second part **66** of the audible end of dose feedback member **58**.

[0468] 161. The autoinjector **10** according to embodiment 159 or embodiment 160, wherein the first and second parts **56**, **66** of the audible end of dose feedback members **58** are formed by a recess **208** and a latching tongue **62** configured to cooperate with the recess **208**.

[0469] 162. The autoinjector **10** according to one of embodiments 159 to 161, wherein the audible end of dose feedback member **58** is configured to emit a sound once the material has been dispensed from the autoinjector **10**.

[0470] 163. The autoinjector **10** according to one of embodiments 159 to 162, wherein the audible end of dose feedback member **58** is configured to emit a sound between the drive chassis **24** and the housing **12** once the material has been dispensed from the autoinjector **10**.

[0471] 164. The autoinjector **10** according to one or more of the preceding embodiments, wherein the inner body **80** further comprises a first cut-out **174**, with the first cut-out **74** being configured to cooperate with a clip arm **184** and a lock-out arm **186** of the needle guard **18**.

[0472] 165. The autoinjector **10** according to embodiment 164, wherein the inner body **80** further comprises a second cut-out **176**, with the second cut-out being configured to cooperate with the lock-out arm **186** of the needle guard **18**.

[0473] 166. The autoinjector **10** according to one or more of the preceding embodiments, wherein the drive chassis **24** further comprises a second trigger arm **36**.

[0474] 167. The autoinjector **10** according to embodiment 166, wherein the second trigger arm **36** is arranged at a side of the drive chassis **24** disposed opposite to the first trigger arm **36**.

[0475] 168. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger limb **32** comprises a passage **140** formed therein.

[0476] 169. The autoinjector **10** according to embodiment 168, wherein the passage **140** is configured to receive at least a part of the drive spring **74**.

[0477] 170. The autoinjector **10** according to one or more of the preceding embodiments, wherein the trigger limb **32** comprises a lip **216** at an end disposed opposite to the web **42**.

[0478] 171. The autoinjector **10** according to embodiment 170, wherein the lip **216** is configured to engage clip arms **184** formed at the needle guard **18**.

[0479] 172. The autoinjector **10** according to embodiment 170 or embodiment 171, wherein the lip **216** comprises two tips **218**, with each tip **218** being configured to engage a respective one of a clip arm **184** formed at the needle guard **18**.

[0480] 173. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle shield **78** comprises a needle receptacle **212** configured to receive the needle **34** of the pre-filled syringe **16**.

[0481] 174. The autoinjector **10** according to one or more of the preceding embodiments, wherein the cap **70** comprises a needle shield holder **104** that is configured to receive the needle shield **78**.

[0482] 175. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle guard **18** further comprises one or more lock-out arms **186**.

[0483] 176. The autoinjector **10** according to embodiment 175, wherein the one or more lock-out arms **186** are configured to cooperate with the inner body **80**.

[0484] 177. The autoinjector **10** according to embodiment 175 or embodiment 176, wherein the one or more lock-out arms **186** are configured to engage one or more bars **178** of the inner body **80** in the lock-out state.

[0485] 178. The autoinjector **10** according to one of embodiments 175 to 177, wherein the one or more lock-out arms **186** are configured to engage a respective one of one or more cut-outs **176** of the inner body **80** in the lock-out state.

[0486] 179. The autoinjector **10** according to one of embodiments 175 to 178, wherein the one or more lock-out arms **186** are configured to engage one or more further cut-outs **174** of the inner body **80** in the dispensing state and in the storage state.

[0487] 180. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle guard **18** further comprises one or more clip arms **184**.

[0488] 181. The autoinjector **10** according to embodiment 180, wherein the one or more clip arms **184** are configured to cooperate with a respective one of one or more cut-outs **174** of the inner body **80** in the dispensing state.

[0489] 182. The autoinjector **10** according to embodiment 180 or embodiment 181, wherein the one or more clip arms **184** are deflected inwardly and abut an inner surface **132** of the inner body **80** in the lock-out state.

[0490] 183. The autoinjector **10** according to one of embodiments 180 to 182, wherein the one or more clip arms **184** are configured to be deflected inwardly by the drive chassis **24** on a proximal movement of the drive chassis **24**.

[0491] 184. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle guard **18** further comprises a plunger arm **142**.

[0492] 185. The autoinjector **10** according to embodiment 184, wherein the plunger arm **142** comprises one or more blocking ribs **144** arranged at a distal end thereof

[0493] 186. The autoinjector **10** according to embodiment 185, wherein the plunger arm **142** comprises two blocking ribs **144**, with the two blocking ribs **144** being arranged oppositely disposed to one another.

[0494] 187. The autoinjector **10** according to embodiment 185 or embodiment 186, wherein the one or more blocking ribs **144** are configured to block a radial movement of the trigger arm **36** in the storage state.

[0495] 188. The autoinjector **10** according to one of embodiments 184 to 187, wherein the plunger arm **142** comprises one or more cams **162**.

[0496] 189. The autoinjector **10** according to embodiment 188, wherein the one or more cams **162** are configured to engage the one or more trigger arms **36** of the drive chassis **24** on activation of the autoinjector **10**.

[0497] 190. The autoinjector **10** according to embodiment 189, wherein the one or more cams **162** are configured to entrain the one or more trigger arms **36** of the drive chassis **24** in the transverse direction T on activation of the autoinjector **10**.

[0498] 191. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle guard **18** comprises one or more protrusions **166** cooperating with a respective one of one or more elongate holes **168** present in the inner body **80**.

[0499] 192. The autoinjector **10** according to embodiment 191, wherein the one or more protrusions **166** are provided to ensure a linear guidance of the needle guard **18** relative to the inner body **80**.

[0500] 193. The autoinjector **10** according to one or more of the preceding embodiments, wherein the needle guard **18** further comprises one or more anti-pull off features **170**.

[0501] 194. The autoinjector **10** according to embodiment 193, wherein the one or more anti-pull off features **170** are configured to prevent a removal of the needle guard **18** from the proximal end of the housing **12**.

[0502] 195. The autoinjector **10** according to embodiment 194, wherein the inner body **80** comprises one or more elongate holes **168** each having a proximal stop **172**, wherein the proximal stop **172** prevents a respective one of the protrusions **166** from being moved proximally beyond the stop **172**.

[0503] 196. The autoinjector **10** according to one or more of the preceding embodiments, wherein the inner body **80** of the housing **12** further comprises at least a part **66** of an audible end of dose feedback member **58**.

[0504] 197. The autoinjector **10** according to embodiment 196, wherein the part **66** of the audible end of dose feedback member **58** comprises an inner body recess **206** having a distal surface **196** and a proximal surface **198** surrounding the inner body recess **206**.

[0505] 198. The autoinjector **10** according to one or more of the preceding embodiments, wherein the inner body **80** comprises one or more cut-outs **174**, **176**.

[0506] 199. The autoinjector **10** according to embodiment 198 and embodiment 196 or 197, wherein the one or more cut-outs **174**, **176** are arranged at an end of the

inner body **80** disposed opposite to the second part **66** of the audible end of dose feedback member **58**.

[0507] 200. The autoinjector **10** according to one or more of the preceding embodiments, wherein the outer body **82** comprises one or more stop features **54**.

[0508] 201. The autoinjector **10** according to embodiment 200, wherein each stop feature **54** is provided at a respective opening **138**.

[0509] 202. The autoinjector **10** according to embodiment 200 or embodiment 201, wherein the respective stop feature **54** is a component of a respective release mechanism **40** of the autoinjector **10**.

[0510] 203. The autoinjector **10** according to one or more of the preceding embodiments, wherein an outer surface **49** of the trigger limb **32** comprises a first and a second part outer surface **50**, **52** whose appearance differ from one another.

[0511] 204. A method of activating an autoinjector **10**, optionally according to one or more of the preceding embodiments, the method comprising the steps of:

[0512] releasing a snap-fit connection **94** between a cap **70** and a needle guard **18**;

[0513] axially moving the cap **70** away from the needle guard **18**; and thereby simultaneously removing a needle shield **78** from a pre-filled syringe **16**.

[0514] 205. A method of assembling an autoinjector **10**, optionally according to one or more of the preceding embodiments, the method comprising the steps of:

[0515] providing a pre-filled syringe **16**,

[0516] providing a needle shield **78**,

[0517] covering a needle **34** of the pre-filled syringe **16** with the needle shield **78**; and

[0518] inserting the needle shield **78** and needle **34** into a cap **70**.

1. An autoinjector comprising:

a housing;

a drive chassis arranged linearly moveable within the housing, the drive chassis comprising a dispensing limb and a trigger limb;

a plunger arranged at a proximal end of the dispensing limb; and

a trigger arm arranged extending proximally from the trigger limb, the trigger limb and the dispensing limb arranged in parallel to one another respectively at least essentially in parallel to one another and are connected to one another at a respective distal end of the dispensing limb and the trigger limb.

2. The autoinjector according to claim **1**, wherein the trigger limb, the dispensing limb, and the trigger arm are integrally formed in one piece.

3. The autoinjector according to claim **1**, wherein the trigger arm is biased with respect to the housing of the autoinjector in a storage state of the autoinjector.

4. The autoinjector according to claim **1**, wherein the trigger arm is configured to be deflected relative to the housing on moving the autoinjector from a storage state into a dispensing state of the autoinjector.

5. The autoinjector according to claim **1**, further comprising a needle guard, and the trigger arm is actuated on by the needle guard of the autoinjector on moving the autoinjector from a storage state into a dispensing state of the autoinjector.

6. The autoinjector according to claim **1**, wherein an outer surface of the trigger limb comprises a first part outer surface and a second part outer surface, the first part outer surface and the second part outer surface having appearances that differ from one another.

7. The autoinjector according to claim **1**, further comprising a drive spring, the drive spring is arranged within the housing of the autoinjector between a distal housing wall and the drive chassis.

8. The autoinjector according to claim **7**, wherein the drive spring biases the trigger arm in a storage state of the autoinjector with respect to the housing of the autoinjector.

9. The autoinjector according to claim **7**, wherein the trigger limb is configured to receive at least a part of the drive spring.

10. The autoinjector according to claim **7**, wherein the drive spring is configured to drive the plunger of the autoinjector into a pre-filled syringe of the autoinjector.

11. The autoinjector according to claim **1**, wherein the drive chassis is linearly guided within the housing on moving the autoinjector from a storage state into a dispensing state of the autoinjector.

12. The autoinjector according to claim **1**, wherein the trigger arm is configured to move radially and transversely with respect to the trigger limb.

13. The autoinjector according to claim **1**, wherein the trigger arm is configured to cooperate with a stop feature arranged at the housing in a storage state of the autoinjector.

14. The autoinjector according to claim **1**, wherein the trigger limb and the dispensing limb are arranged in a generally U-shaped manner.

15. The autoinjector according to claim **1**, wherein the trigger limb further comprises at least a first part of an audible end of dose feedback member.

16. The autoinjector according to claim **15**, wherein the housing comprises at least a second part of the audible end of dose feedback member, or

the first and second parts of the audible end of dose feedback member are formed by a recess and a latching tongue configured to engage the recess, or

the audible end of dose feedback member is configured to emit a sound once the material has been dispensed from the autoinjector,

the audible end of dose feedback member is configured to emit a sound between the drive chassis and the housing once the material has been dispensed from the autoinjector.

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